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Note

Poverty and Famines in Bangladesh*

by

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The consequences of famines, manifested in the form of short-run economic fluctuations, act as a good measure of the extent of vulnerability of a low-income agrarian economy like Bangladesh. Various hypotheses have been forwarded to "explain" famines, most of these seeking causes in natural disasters, food availability decline or fluctuations in "exchange entitlements". The present study argues that these explanations, individually considered, constitutes an inadequate basis for analysing famines, and further contends that famines must be seen as simply an extension of poverty. Analysis of famines must therefore essentially emanate from various poverty-themes and the structure of the economy to which these themes may relate. The study attempts to make a *prima facie* case for the above approach, drawing largely from the experience of the 1974/75 famine of Bangladesh.

I. INTRODUCTION

A fundamental feature of a low-income agrarian economy is its vulnerability to short run fluctuations, which are conspicuous in their negative aspects. Such a fluctuation could easily result in a temporary "break down" in the economy and carry in its sweep widespread famine, destitution and deaths. Apart from its socio-political consequences, the phenomenon of violent periodic fluctuations has important economic implications as well. Although a cause and effect relationship is less clear, famines certainly move closely with the long term determinants of growth or non-growth. The relationship can be mutual : (i) Famines cannot only be a positive "cost" to the economy (viz. additional expenditure on relief, physical diminution of capital stock, especially in the rural areas), they can also modify the relations of production by affecting, in various intensities, the existing property relations. Such alterations do not surface so quickly and must be assessed within a sufficiently broad historical perspective.[1] (ii) On the other hand, the *levels* of technology and growth, and the particular production relations that sustain them, could themselves unleash

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*This is a revised version of a part of my Ph.D. thesis submitted to the University of Cambridge [34]. I am grateful to Professors Brian Reddaway and Amartya Sen for extremely helpful comments on an earlier draft of the paper. Errors and opinion are, however, entirely mine.

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[1]We are told of the impact of famines on the changing agrarian structure of France in the 18th century, cf. Kula [27, p. 67].

forces to which famines are proximately attributable. In this study we shall deal with the latter form of relationship.

While various strategies are being attempted on the policy aspects *vis-a-vis* famines, there is a relatively very scanty information on the broad theoretical issues involved. A lack of understanding of the true character of modern-day famines, and how they are precipitated, would definitely tend to bias judgement on policies. There is hardly any analytical study on famines, although their narratives exist in bounty. In this study, we shall attempt to construct a framework to evaluate how far various "structural" explanations related to the poverty syndrome[2] also apply to the famine situations in low-income agrarian economies. The much publicised famine of 1974/75 in Bangladesh provides us with an interesting starting point.

The study is designed as follows. In section II, we first attempt to provide a general framework for a study of famines. Next, in Section III, we briefly evaluate the significance of famines in Bangladesh, with a particular overview of the 1974/75 famine. In Section IV, we attempt to test the validity of the major explanations of famines, each considered independently of another, against the 1974/75 famine in Bangladesh. In the light of our general approach to famines, outlined in Section II, we try to construct and develop our stance on famines in a low income economy such as Bangladesh in Section V. The implications emerging from our analysis for growth and distribution are also briefly noted here. The nature of the government's foodgrain distribution policy in the rural and urban sectors to mitigate crisis situations is critically examined in Section VI, while Section VII states the conclusion of the analysis.

II. THE FAMINE FRAMEWORK : A STRUCTURAL APPROACH

There are apparently various explanations for famines that have occurred in low-income economies over recorded time.[3] The very early famines appear to be invariably connected to issues of wars and poor communications. While both these features are still present in a modified form,[4] the explanations for modern-day famines seem to range from natural disasters, food availability decline, fluctuations in "ex-

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[2]For a detailed account of this relationship, see Muqtada [34].

[3]Among other investigations, see [4 ; 9 ; 13 ; 31 ; 41], and also the official enquiry reports of the Famine Commission 1880, and Famine Enquiry Commission, 1944.

[4]Let us recall that the 1943 famine took place during a war, and the 1974/75 famine in a milieu of dislocation caused by the Bangladesh civil war in 1971.

change entitlements",[5] to the role of state *vis-a-vis* controlled distribution. We shall try to show, in a latter section, that these explanations, viewed individually, may fail to provide a comprehensive account of famines. We tend to believe that their lack of complete explanatory power perhaps pertains to their lack of reference to the structure of the economy itself, which may dictate the relative strength of the above expositions.

Accordingly, we forward our contention that famines in a low-income economy must be seen simply as an extension, *albeit* an extreme example, of the poverty-situation obtaining in the economy. Viewed thus, famines constitute a deeper malaise than appear, and must naturally be related to the structural, institutional and technological constraints operating within the economy. The recurring famines which cause aberrations and even a breakdown of the normal economic relationships, would therefore reflect the fragile structure of the economy, which also affect the already vulnerable sections of the population.

Poverty, we maintain is not simply a relative concept ; it also has absolute connotations, particularly for a poor country.[6] In this sense, we may state that "poverty" and "famines" are not significantly different concepts. Both tend to describe the same phenomenon, only emphasizing different degrees of intensity. Thus while in the most advanced countries, like the U.S.A. and U.K., we often hear of a tangible proportion of the population living in poverty conditions, these people, we are assured, do not suffer from ignoble deaths.[7] Whereas in Bangladesh, mainly as a result of population pressures and unequal land ownership structure, destitution and mass hunger are visibly widespread even in relatively tranquil periods. The vast majority of the rural population are getting increasingly less to eat than is physiologically desirable, even on austere standards, and hence are under the constant spectre of malnutrition. If it were possible at all to impute a value to the "loss" of health owing to malnutrition, one could perhaps discern a famine even though there may not be a sudden violent shake-up of the economy. Hence, to state that, in an important sense, Bangladesh is in a state of perpetual famine should not in any way rob the concept of famine of its commonly known attributes (viz., deaths, destitu-

5This approach is due to Sen [39]. Briefly stated, it argues that if the terms of exchange are such that a family fails to procure enough food with the endowments at its disposal, starvation will take place.

6"There is an irreducible core of *absolute* deprivation in our idea of poverty which translates reports of starvation, malnutrition and visible hardship into a diagnosis of poverty without having to ascertain first the relative picture", Sen [40, p. 11].

7For explanations and empirical work on poverty in these countries, see, for instance, the pioneering work by Orshansky [36]. Also see [3 ; 7 ; 22 ; 43].

tion, migration, etc.). At the same time, Bangladesh is experiencing increasing relative impoverishment ; that is to say, the 'tail' of the distribution, to whom the concept of famine is applicable, is increasing over time. It is precisely within such a context, we would argue, that the various explanations of famines must be intrinsically related to poverty-themes.

The mode of causation of famines may be drawn through a set of broad contours. It has been observed that in a normal year, Bangladesh has not only a very low level of per capita income and a skewed distribution of income and landholdings, but also a large proportion of households whose real purchasing power is below the 'poverty line'. In such a context, a sudden bad harvest would inevitably tend to lower the average real income of the population. Even if the distribution pattern were to remain the same, this would imply a further increase in the number of people below the stated poverty line. The three main classes of rural population who usually bear the onslaught of a famine crisis are naturally (i) the agricultural labourers; (ii) small peasants and tenant-cultivators (a majority of whom have to supplement their minimum total earnings through wage income) ; and (iii) other petty non-agricultural workers (including small traders, fishermen, blacksmiths, potters, etc.). Since a famine entails a change in the distribution of food, one must note that all the categories above (with some possible exceptions from the second category, who may be self-sufficient food producers) have to depend on some exchange, in whatever form, for procuring their food. The nature of involvement in exchange for these categories may vary from one another.

The precipitation of a famine situation may arise from one or more of a number of adverse developments or random shocks, such as floods or droughts, although these may not affect the entire economy nor cause an absolute shortage of food. A crucial character of a low-income economy is that there are hardly any automatic stabilizers to halt the consequences arising out of these random shocks. Thus famines may stem from a purely local and regional phenomenon. The regional crisis may normally entail (i) a reduction in total (potential) output of food ; and (ii) destruction of some families' income by affecting their 'employment entitlements'—but only in the region concerned.[8] Even within the confines of this *local* problem, the extent in the fall of employment, as we shall see later, need not be dramatic.[9] In any event, the initial brunt of famines is borne by those sectors of the local population who fully or partially depend directly on employment for their income, viz., the landless agricultural labourers, and small peasants and tenants who depend partially on wage

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[8]Such was perhaps the case with the Lancashire spinners and weavers during the "cotton famine" of the 1860s in England, precipitated by the American Civil War.

[9]This is partly due to the nature of work-sharing present in the agriculture of many LDCs.

incomes, as well as those farmers whose foodcrops may have been destroyed by the initial catastrophe. There may be efforts to restore purchasing power to these *loccl* 'victims', through direct monetary compensation or relief works by the government or relief-agencies ; and where the situation is worse, by setting up 'gruel kithens' to feed the totally uprooted. Both the methods of relief, through woiks programme or gruel kitchens, would fail to cope with this *local* problem. Firstly, the relief works programmes are a less easy way of restoring purchasing power, since they involve designing, problems of location and also a minimum lag in implementation and hence distribution of food incomes. Secondly, the 'gruel kitchen' method fails to identify the 'victims' from a very large proportion of 'non-victims' who are subsisting well below the poverty line.[10] Thirdly, if the government decides on movement of food (through increased imports or releasing stocks) to the region by injecting stocks into the market, this may help to keep the local food prices from rising,[11] but would not readily come to the aid of the already afflicted, who in any event, have become dependent on contingency relief.

A growing speculation that measures to mitigate the crisis would prove inadequate may pave the way for increases in food prices—thus further aggravating the famine situation for the affected region. It is at this critical stage that one tends to observe fluctuations in "exchange entitlements" of an even bigger proportion of the *local* population than directly affected by any catastrophe. The failure of "exchange entitlement" is usually very critical for the *non-food* producers who are totally dependent on the exchange nexus to sell their commodities (whose markets may be declining *vis-a-vis* food) and to buy their minimum food (whose prices have started rising). While the government provision for the rural poor is extremely negligible, a sudden shake-up in the distribution of food and incomes, forces the vulnerable and directly affected population to stretch their means of staying power. They resort, rather precariously, to various devices : (i) sale of exchangeable assets, viz., ploughs, cattle, etc., (ii) provisions within an extended family system, (iii) credit, mostly form non-institutional sources, and (iv) relying on charity, begging or even theft.

Thus the initial factors or the random shocks which we call the *primary* forces of famine, actually get compounded and set the background in which the 'local'

10We are told that the gruel kitchens which were opened in Bangladesh in 1974 had to be closed down hurriedly, after three months in operation. This was because of the pressure not simply from the destitutes, but also from the bulk of the unaffected population considered poor, although perhaps still employed.

11Corruption, hoarding, blackmarketeering, however, may easily offset the effectiveness of such a participation by the government in the free market.

problems are transmitted wider and wider until the spectre of famine exposes the vulnerability of the entire economy, wherein the majority of the population within the three classes noted above struggle for existence. The secondary forces usually take off in the form of rising prices of foodgrains which leads to further speculation, hoarding or simply "holding back" of foodgrains. The secondary forces thus tend to accentuate excess of demand over supply. The relative strength of the primary and secondary forces are difficult to measure, and depend on the context in which the initial conditions are found. For instance, the primary forces may be all embracing if there were an economy-wide drought or flood, and the majority of the cultivating population being small farmers, together with the landless near-landless would quickly face the initial burnt of the crisis. What is, however, of consequence for our analysis is to note the rapidity with which the primary forces, even if feeble and/or regional in character, give way to the secondary forces. It then becomes a rather tricky matter to say whether or not there has been a local famine, and implicitly underlines our stance that famine is an extension of the pervasive poverty situation already existing in the economy.

III. BANGLADESH FAMINE, 1974/75

It may be argued that Bangladesh, since its inception, has never been beyond famine conditions.[12] In fact, the regions which today constitute Bangladesh have witnessed famines from very early times. Several districts of Bangladesh were among the worst sufferers during the great Bengal famine of 1943, particularly the districts of Chittagong, Noakhali, Faridpur, Khulna and Barisal. As a part of Pakistan, the country was exposed as an extremely low-income economy. Famines occurred quite frequently, and in considerable magnitudes, particularly in 1956, 1962 and 1974/75. Apart from these, there have been notable food calamities in frequent succession over the recent past. Conditions have so worsened that it has at one stage been dubbed as "an international basket case."[13] Others in evaluating the economy have, however, been less dramatic and pessimistic.[14] Nevertheless, Bangladesh, with its famines, has by now proved to be a classic laboratory case for national and international bodies, voluntary agencies and international aid-giving agencies. Famines in Bangladesh provide a challenging theme in modern-day development—theory and policy alike.

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[12]The situation is akin to what Power and Holenstein [37] call "creeping famine", p. 50.

[13]U. Alexis Johnson, during his office as Under Secretary of State of U.S.A., quoted in *International Policy Report*, May 1978.

[14]Faaland and Parkinson [14], Rene Dumont [12] Hartmann and Boyce [23], are also cautiously optimistic.

Due to paucity of relevant information, it is not possible to investigate properly into what had precipitated the various famines.[15] There is perhaps relatively more information on the 1974/75 famine, and this will provide the basis of our analysis of famines.

The 1974/75 famine occurred in the wake of the government's efforts at reconstructing the greatly dislocated economy, rendered so by the civil war in Bangladesh in 1971. The famine was preceded by heavy floods which affected, in differing degrees, the various districts of Bangladesh except Chittagong Hill Tracts, Jessore and Khulna.[16] Deaths and destitution during the famine were widespread, although correct estimates are not available. An author quoting unofficial reports suggest that from about 350,000 lives lost through famines in South Asia during 1974/75, "Bangladesh accounts for perhaps 250,000 or about half the total deaths, although official estimates are considerably lower."[17] The official estimates have been put at 26,000.[18] This figure appears to be rather meagre compared to the above and also other estimates quoted internationally.[19] The intensity of a famine, however, should not necessarily be judged solely by the extent of loss of human lives and starvation alone.[20] One could perhaps state that the enormity of the famine conditions was a part-cause leading to the downfall of the then existing political regime.[21] Irrespective of the number of deaths, the situation in 1974/75 was serious enough to compel the government to open as many as 5, 862 gruel kitchens (*langarkhanas*) which fed about four million people.[22] The BIDS, which conducted a survey of these gruel kitchens situated in various areas, reports deaths and destitution shown in Table I. Although there may presumably be a bias in the above figures (for instance, the members may

[15]The only information that can be extracted are from the official reports which provide data mostly on the loss of crops and areas affected by floods or cyclones. See, for example [19 ; 20].

[16]See [17].

[17]See Kristensen in Aziz (ed.) [5, p. 28].

[18]Quoted in Alamgir [2, p.2].

[19]See, for instance, Hartmann and Boyce [23], who quote a figure of 10,000 in a single north-western district, (presumably Rangpur, which was among the hardest hit).

[20]Benjamin Jowett, Master of Balliol, "I have always felt a certain horror of political economists since I heard one of them (N. Senior, a Government adviser on economic affairs) say that he feared the famine of 1848 in Ireland would not kill more than a million people, and that would scarcely be enough to do much good"—quoted in C. Woodham—Smith [44, p. 373].

[21]The succeeding regime issued a White Paper on the economic situation in Bangladesh [12 September 1975] which blamed the earlier government for "financial anarchy" and "large-scale suffering of the people", p. 1.

[22]Gruel kitchens were placed where the people uprooted by the 1974/75 calamity were fed. They were run from September to December in 1974.

exaggerate their "distress" for material sympathy ; perhaps, a large proportion of the population who are poor but otherwise unaffected by the floods may have also reported in a similar fashion at the (*langarkhanas*), the magnitude of the famine was beyond question a serious one.

TABLE I

DEATHS AND DESTITUTION DURING 1974/75 FAMINE, BANGLADESH

Areas	Percentage of *Langarkhana* Households Uprooted		Death as % of Total *Langerkana* Population
	Totally	Partially	
Bagerhat	34.07	65.93	3.16
Mymensingh	100.00	—	2.41
Dhaka	65.35	34.65	3.02
Khulna	89.11	10.89	1.14
Ramna, Rangpur	100.00	—	3.53
Dewanganj, Mymensingh	100.00	—	3.37
Rangpur	82.18	17.82	4.81
Gorarang, Sylhet	100.00		4.74
Total	84.26	15.74	3.17

Source : BIDS, *Langarkhana* Survey, 1974 [1].

Note : Death figures are as reported up to the survey period. The causes of death are not cited, however.

IV. TOWARD AN EXPLANATION OF BANGLADESH FAMINE 1974/75

The reasons which gave way to the 1974/75 famine in Bangladesh are perhaps numerous. Modern-day famines in the Third World are usually traced to (i) natural disasters ; (ii) food availability decline ; and (iii) fluctuation in 'exchange entitlements'. We shall by and large proceed along the 1974/75 famine, and attempt to produce specific evidence to test whether these explanations, considered independently, can truly capture the cause of famines in low-income agrarian economies.

Natural Disasters

Natural disasters in Bangladesh are almost always in the form of floods, cyclones and tidal bores ; there are records of droughts as well. The frequency of floods

is almost annual, but there need not be any extensive loss of crops every year. As a matter of fact, floods are responsible for supply of water for the *aman* and *boro* rice crops in several areas. It is the depth and timing of the floods that is crucial to the loss of crops which differ in their degrees of resistance to floods. *Aus*, for instance, is relatively more resistant than the transplant *aman*.[23] Since *aman* accounts for the highest contribution to total rice production in Bangladesh, a flood that affects the *aman* crops would naturally cause greater shortage of food than if it had affected some of the other crops.

Because of the nature of flooding and its timing, there may develop a non-correspondence between the extent of areas apparently affected and loss of foodgrains. Table II traces the two variables during the years between 1954 and 1970, for which information is available. We find the lack of a significant correspondence between flood area and loss in rice crops. In 1955, for example, when 15 thousand square

TABLE II

EXTENT OF FLOOD-AFFECTED AREAS AND LOSS IN RICE CROPS IN BANGLADESH, 1954—1970

Year	Flood Area ('000 sq. miles)	Loss in Rice Crops ('000 tons)
1954	14.2	443.0
1955	15.0	474.0
1956	13.7	800.0
1962	14.4	754.0
1963	13.6	83.5
1964	12.0	181.0
1965	11.0	34.7
1966	12.9	459.4
1967	9.9	83.3
1968	14.4	1105.6
1969	5.2	217.4
1970	16.4	1190.0
1974	22.0	1200.0

Source : (i) [24], Vol. VIII ; for figures up to 1969.
(ii) [17], for 1970, 1974.

Note : Loss in rice crops is rather crudely assessed. From the yearly acreage (and average yield) figures, the yearly potential output is estimated. The difference in *potential* and *actual* output is registered as loss in crop production. This is rather vague and does not include various other factors that may be responsible for a reduced crop production in any year.

23See [24].

miles of land were flooded, there was a loss of 0.48 million tons of rice crops, whereas in 1968, a smaller flood-affected area was accompanied by a loss of more than one million tons of rice. The coefficient of variation, although significant, is not very high. Besides, not all the years which have registered higher flood-affected area, have been years of famine. Thus floods alone cannot explain the various famines in Bangladesh.

Table III gives the rice production figures for 1968/69 to 1976/77, and the percentage lost due to floods and drought.[24] The percentage of loss of rice crops during 1974/75 is quite substantial, but this has not remarkably affected the actual total figures of rice production which are very close or even higher, than the actual figures of the

TABLE III

LOSS IN RICE PRODUCTION IN BANGLADESH AS A RESULT OF NATURAL DISASTERS, 1968/69—1976/77

(million tons)

Year	Rice Production (1)	'Loss' due to Flood and Drought (2)	Percentage 'Loss' (2) ÷ (1) × 100 (3)
1968/69	11.60	1.11	9.6
1969/70	11.82	0.22	1.9
1970/71	10.97	1.95	17.8
1971/72	9.79	0.31	3.2
1972/73	9.93	0.25	2.5
1973/74	11.72	0.65	5.6
1974/75	11.11	1.54	13.9
1975/76	12.56	0.16	1.3
1976/77	11.57	0.95	8.2
Total	11.23	0.79	7.04
Coefficient of Variation	9.41	6.73	

Source : [21].

preceding years. On the other hand, potential output was most severely affected in 1970/71 (17.8% of actual production), but we do not hear of widespread famines

[24]Crops in Bangladesh, it may be noted, are affected both by floods as well as drought. The effect of drought on crops in 1979 and 1981 has been alleged to be formidable.

in that year. This does not, however, mean that floods cannot significantly affect the loss of rice crops in a year ; famines cannot be significantly attributed to natural disasters.[25]

The FAD View

We now turn to the approach which states that food availability decline was mainly responsible for the 1974/75 famine in Bangladesh. The FAD view takes into account both the total (including import and off-take of foodgrains) and per capita availability of foodgrains in the country.

In order to determine whether there was a sharp decline in foodgrain availability, we have constructed Table IV providing figures for net food crop production within the country, and per capita availability for the years 1969/70 up until 1975/76. The respective indices are also shown, with 1971/72 as the base. Although 1974/75

TABLE IV

NET PRODUCTION AND PER CAPITA AVAILABILITY OF FOODGRAINS IN BANGLADESH 1969/70—1976/77

(Index : 1971/72=100)

Year	Net Production* (million tons) (1)	Index (2)	Food Imports (million tons) (3)	Per Capita Availability** (lbs. per year)	Index
1969/70	10.72	120.5	1.55	391.8	118.9
1970/71	9.96	111.9	1.26	351.2	106.6
1971/72	8.90	100.0	1.69	329.4	100.0
1972/73	9.02	101.4	2.74	355.9	108.1
1973/74	10.61	119.2	1.64	360.4	109.4
1974/75	10.11	113.6	2.26	335.6	101.9
1975/76	11.50	129.2	1.42	344.7	104.7

Source : World Bank, *Bangladesh : Current Trends and Development Issues*, [46].

Notes : *Net production includes gross production of the three rice crops and wheat minus 10% as deduction for seed, feed and wastage.

**Total availability is estimated by adding to net production imports and off-take from stocks minus internal procurement of foodgrains.

[25]See Morris [32].

returns comparatively lower figures than most of the years, it shows up a better food situation than the year 1971/72. Total net production is almost 14 per cent higher, and the per capita availability is also higher than in 1971/72. The per capita figures show that for 1974/75, the foodgrains available for consumption was 14.7 ounces per person per day compared to 14.4 ounces in 1971/72. From these figures, if one were to follow FAD view, there arises the issue of why the famine took place in 1974/75 and not in 1971/72.[26]

The situation in Bangladesh bears very close resemblance to that in Bengal during the great Famine, as reported by Sen[27] as well as by the Famine Enquiry Commission.[28] The year of famine (1943 and 1974/75) was preceded by a recent year (1941 and 1971/72) in which the foodgrain availability was lower than that during the famine year ; and followed by a year of record harvest (1944 and 1975/76). The state of perplexity that the FAD view had aroused with respect to the 1943 Famine in Bengal, therefore also applies to the 1974/75 famine in Bangladesh.

Following the FAD approach, Bose [10] and Chen and Rhode [11], among others, have attempted to explain the non-occurrence of a famine in 1971/72. The authors all agree that the famine in 1971/72 was almost inevitable, but that it was averted because it was possible to "export" a potential famine to India, by the massive outflux of refugees during the 1971 Civil War, which also led to abnormal deaths of civilians.[29] This is a rather intriguing explanation, and if true, would lend support to the FAD view. According to the two sources, the amount of consumption that was "saved" due to killings, deaths and migration to India was between 0.68 million tons (Chen and Rhode)[30] and 0.56 million tons (Bose)[31] of foodgrains. Even if we take the higher figure we still find a deficit of about half a million tons in 1971/72, and surely, the bulk of the population was still within Bangladesh to face the situation. Thus the FAD view is seen once again as an incomplete explanation of famines.

"Exchange Entitlements" and Bangladesh Famine

Finally, we turn to the approach of "exchange entitlements"[32] and attempt to find out the extent to which it applies in the context of the Bangladesh famine.

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[26]Chen and Rhode [11] estimates a net per capita availability of 14.0 ounces for 1971/72, after accounting for outflux of refugees into India.

[27]Sen [39, p. 41].

[28]Famine Enquiry Commission (1945), Report on Bengal, See Appendix I of the report.

[29]See Bose [10, p. 299] and [11, pp. 197-200].

[30][11, p. 199].

[31][10, p. 299].

[32]For an evaluation of the approach of "exchange entitlements", see the Appendix to Chapter VII in [34].

First of all, we deal with agricultural labour, and find out the index of exchange rate of wage *vis-a-vis* the price of rice. This is given in Table V, which gives the indices of the daily wage rate, price of rice and the exchange rates, with 1971/72 as the base. The table clearly shows a declining exchange rate for labour, reaching its lowest in 1974/75. A similar conclusion is reached even if we had used the cost-of-living index for the poor, as shown in the same table,[33] although the decline is not as sharp.

TABLE V

INDICES OF EXCHANGE RATES BETWEEN AGRICULTURAL LABOUR AND RICE/COST-OF-LIVING IN BANGLADESH, 1969/70-1975/76

(Index : 1971/72=100)

Year	Daily[a] Wage (Taka)	Wage Index	Rice[b] Price (Taka)	Index of Rice Price (A)	Index[c] of Cost-of-living (B)	Exchange Rates	
						(A)	(B)
1969/70	2.91	86.1	39.50	83.4	74.1	103.2	116.2
1970/71	3.14	92.9	38.73	81.7	72.7	113.7	127.8
1971/72	3.38	100.0	47.38	100.0	100.0	100.0	100.0
1972/73	4.69	138.8	79.16	167.1	170.1	83.1	81.6
1973/74	6.72	198.8	104.82	221.2	235.3	89.9	84.5
1974/75	9.05	267.8	223.30	471.3	356.8	56.8	75.1
1975/76	8.82	261.0	129.06	272.4	289.0	95.8	90.3

Notes and Sources : [a]Nominal daily wage (without food) ; see [34] Chapter 3 for a discussion of the sources and limitations of the date.

[b]Coarse quality (wholesale price) ; Cf. Alamgir [1].

[c]Cost-of-living index of the poor ; for sources of data and methodology of its construction, see sources as in a.

We have also estimated the labour/rice exchange rate, month-wise, from October 1973 to June 1975 (see, Appendix, Table A.I). The maximum decline is registered

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[33]Note that for the period 1974/75 cited in Table V, the index of rice price exceeds the cost-of-ling index, i.e., the price of rice was increasing faster than prices of other commodities included in the estimation of cost-of-living. In such a situation, whether the population resorts to redefining their "consumption bundle" could not be verified for lack of sufficient data. Hence exchange rate *vis-a-vis* rice is presumably a better indicator than that based on the cost-of-living index. One must note in this connection that in the estimation of cost-of-living index, market prices are included. Such an index could not be used for deflating level of living of the *urban* poor, since the bulk of the latter's consumption has to be "ration-priced".

in the last quarter of 1974 and the first quarter of 1975. However, the extent of decline in exchange rates that would cause destitution or death is not known. For, going simply by the *rate* of agricultural wages, we have seen that real wages have shown declines in several years, and sometimes, continuously.[34] Moreover, if we look into the occupational distribution of the *langarkhana* destitutes (Table VI), we find that agricultural labour constitutes only 18 per cent of the surveyed population living on charity. It is the category of peasants which registers the highest rate of destitution. It is observed that these farmers are primarily small peasants,[35] who have to supplement their income through hiring themselves out as agricultural

TABLE VI

OCCUPATIONAL DISTRIBUTION OF *LANGARKHANA* INMATES

Groups	Percentage Distribution
Farmer	45
Agricultural Labourers	18
Non-Agricultural Labourers	20
Others	17
Total	100

Source : BIDS, *Langarkhana* Survey [1].

labour. Hence, exchange entitlement based on the *rate* of wages is not sufficient to explain why the small farmers have turned destitutes. Similarly, for a few non-rice commodities, for example, milk (not a very sharp decline) and mustard (in fact, shows a rise), the exchange entitlement approach would imply that there cannot be destitution among these categories (see Appendix, Table A.2). This, however, would be a rather unwarranted conclusion.

Thus we find that while "exchange entitlement" is an important factor in the explanation of the famine in Bangladesh, it provides a less than complete account of it.

V. POVERTY AND FAMINES

We have observed so far that to view the cause of famines simply in the manner of the existing explanations, as considered individually within the context of 1974/75

[34]See [34, p. 75].

[35]See Alamgir [2].

famine in Bangladesh, may remain misplaced and incomplete. The nature of these explanations, on closer examination, is seen to be lacking in any reference to the nature of the economy itself. For a proper understanding of famines in low-income agrarian economies, we contend that a famine should be regarded as simply an extension of poverty, and thus must be related to the various structural explanations cited in the context of poverty analysis.

The 1974/75 famine in Bangladesh appears to have closely followed the general famine framework which we have outlined in an earlier section. It is indeed observed that the famine came in the wake of widespread floods, but not all the districts were sharply and equally affected by these floods.[36] Moreover, even within a particular district, not all the regions were disastrously affected.[37] The famine whose impact was visibly felt in the entire country, appears actually to have stemmed from local disaster which occurred in an appreciable scale. Although there was bound to be a loss of local crops and employment, the aggregate shortfall in either for the whole economy was not very sharp.[38] The problem of the loss of income and employment of those who were directly affected was compounded by the rise in prices following local scarcities of foodgrains. This was further sustained by the government's failure to immediately cope with the local crises ; and soon, predominantly due to speculation, there was a sudden, sharp rise in general prices throughout the economy. Thus the vulnerable population not only in the initially affected areas, but also in other areas, was exposed to starvation and deaths. Although there are hardly any accurate figures available, we may safely state that there were abnormal number of deaths in varying degrees all over the country,[39] the situation perhaps being worse in the areas immediately affected by the floods.

The BIDS Survey, the only notable survey on the famine of 1974/75, which carried out detailed investigation of various famine and non-famine areas,[40] allows us to provide clear support to our contention that famines and poverty are intricately related. Table VII, succinctly does so. It must be pointed out that the Survey authors have distinguished famine from non-famine areas on the basis of whether or not they were flood-afflicted.[41] According to our framework of analysis, such a distinction may not however the tenable since there need not be a universal correspondence between flood-afflictions and famines. In Table VII, we have carefully

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36See, [17].

37For instance, Khulna district comparatively less affected by the floods. See reference above.

38See Tables IV and IX.

39See Section III and Table I.

40See Alamgir, [1]

41*Ibid*, p. 2.

selected 16 important indicators of the comparative structure of production and economic condition of what the survey states as "famine" and "non-famine" areas in rural Bangladesh. Almost all the indicators together imply that both the curiously dichotomised "famine" and "non-famine" areas are potentially quite vulnerable to short-term crises in the economy, and that there is hardly anything to suggest that the so-called disaster areas are *more* vulnerable than the non-disaster areas. In fact, Table VII, shows that the indicators cited tend to suggest relatively more adverse situations in one of the non-disaster areas. For instance, with regard to land per capita and per household, Gini coefficient of landholding, per capita income,

TABLE VII

COMPARATIVE ECONOMIC CONDITIONS OF SELECTED 'FAMINE' AND 'NON-FAMINE' AREAS IN BANGLADESH, 1974

Principal Indicators	'Famine Areas' (average)	'Non-Famine Area' (Charbaniari, Khulna)
1. Land per household (operational/acres)	1.61	1.36
2. Land per capita (operational/acres)	0.29	0.22
3. Gini Coefficient, Land (operational/acres)	0.56	0.55
4. Landless (%)	29.0	13.0
5. Gini Coefficient (agric. income, with family labour)	0.41	0.44
6. Gini Coefficient (total income)	0.41	0.39
7. Per capita income (without income of family labour) Tk.	647.4	504.3
8. Per household income (total income) Tk.	2982.6	2461.9
9. Average household size	5.6	6.0
10. Dependency ratio	2.06	2.91
11. Average number of earners	1.8	1.5
12. Rate of unemployment	0.24	0.29
13. Wage labour's income (% of total income)	13.9	13.5
14. Decline in average landownership (1972-74) (%)	2.42	3.20
15. Distress sale per household (acres) (selling land during 1974)	0.35	1.16
16. Net paddy purchase sale in 1974/75 (%)		
(i) Deficit households	63.3	75.9
(ii) Subsistence households	19.1	16.1
(iii) Surplus households	17.6	8.0

Source : [1], Vols. I and II.

Note : Famine Areas represent average estimates of three villages, chosen from the districts of Rangpur and Sylhet.

dependency ratio, unemployment rate, etc., and all such crucial structural features, we find that a non-disaster zone is no better off than the disaster ones.

Once we fully and carefully appreciate the above distinction, we may argue that the relevance and relative strength of the existing explanation of famines must depend on various structural features of the economy. All the arguments, however, cannot be highlighted because of lack of sufficient and consistent data ; only a rough order of the magnitudes will be provided. For this, we rely largely on the 1974 BIDS Survey of 1974 households in eight villages (classified as famine and non-famine villages), and 788 *langarkhana* users.[42] We shall refer to them, for convenience, as the Famine Survey and the *Langarkhana* Survey respectively.

Exchange and Markets

Famines are indeed closely linked with the lack of purchasing power. In this regard, the force of the "exchange entitlement" argument is not to be ignored, in as much as it relates to a developed exchange economy. In the case of Bangladesh, we have earlier contended that it is not a fully developed exchange economy. This emphasizes why various explanations can become inadequate in nature, both with respect to regions and specific groups of individuals. We do not have the relevant information on the destitute families of 1974/75 as to what proportion belong to the self-producing, self-consuming class. This proportion would then be liable to the vagaries of natural disasters. The following table (Table VIII) from the *langarkhana* survey gives us some approximate information. We find that the floods of 1974 did, in fact, quite substantially affect the families that had possessed cultivated holdings (column 5). According to the Survey, for affected families having cultivable land, 66.3 per cent of their operational holdings were affected by the floods. However, the percentage of such families to the total number of destitutes is only 23 per cent. One may recall here (see Table VI) that it was the "farmer" category which constituted the highest percentage of destitutes. This would imply that a large proportion of farmers who possessed land and were not affected by the floods, must have suffered a decline in their "exchange entitlements".

Although the extent of *net* marketed commodities (including labour) is quite small,[43] the overall extent of market involvement may be quite substantial. For

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42The survey data have been compiled as a statistical compendium under innumerable headings by Alamgir *et al.* and published by the BIDS. The source has already been quoted in this chapter under Alamgir [1]. All definitions and methodology are given in the statistical compilation above.

43In Bangladesh as a whole, net marketed surplus of paddy is estimated to be around one-tenth of total production see [15].

TABLE VIII

DESTITUTE FAMILIES AND AGRICULTURAL HOLDING AFFECTED BY FLOODS, 1974/75

Area (1)	Number of Households (with or without agricultural land) (2)	Number Affected by Floods (3)	Percentage Affected (4)	Percentage of Cultivated Holdings Affected by Floods (for people who were affected) (5)
Bagerhat	91	57	62.6	97.9
Mymensingh	97	3	3.1	—
Dhaka	101	33	32.7	81.2
Khulna*	101	10	9.9	70.1
Chilmari	102	30	29.4	80.9
Dewanganj	95	19	20.0	52.2
Rangpur	101	14	13.9	59.2
Sunamganj	100	17	17.0	32.1
Total	788	183	23.2	66.3

Source : BIDS Survey of *Langarkhana* Inmates [1].

Note : *Although the destitute families in Khulna report a high percentage of land affected by floods (see column 5), this was perhaps not the general case in the district. As a matter of fact, this was one of the least flood-afflicted areas during 1974/75. See [17].

instance, the small producers do a significant amount of selling and "buying back", which together returns a low figure for their marketed surplus.[44] In famine situations, when food prices rise sharply, they apparently should be able to take advantage of it through exchange unless their crops are substantially damaged. However, there are evidence to suggest that the various markets relating to production and exchange are not only imperfect but also to a great extent, interlinked.[45] And because of their own poverty conditions, they cannot withhold any stocks for better prices. As a matter of fact, the very process of the small producers' having to sell and buy back reveals the extent of their vulnerability. Moreover, they invariably sell after the harvests when prices come down, and buy back during lean times when the prices are high. There is thus a situation in which the small peasants (especially

[44]There are several studies at the micro-level on the relationship between marketed surplus and farm size. Such studies, by and large, abstract from the realities behind the nature of market participation by various classes of producers. Among others, see [6 ; 26 ; 28 ; 30 ; 35].

[45]See [34], Chapter V.

the small owner-cum-tenants) are involved in a 'forced' participation revealing what Bhaduri calls an "unequal exchange".[46]

The *Langarkhana* survey does not provide us with any useful information to highlight the above ; the Famine survey, however, allows us to measure the size-specific extent of marketed surplus as a proportion of the net output. This is shown in Table IX, from which we find that more than 90 per cent of the sample households in the famine areas have registered excess of purchases over sales. The high negative net marketed surplus as a proportion of net output for the smallest landholding category has been obviously forced by the famine conditions. However, it is not unlikely that even in normal times, the small peasants have a negative marketed surplus, paid for by total family income, wage-labour, etc.

Given their initial poverty status, the small farmers turn to institutional and noninstitutional sources of borrowing. The nature of the dependence on various such sources, and extent of borrowed money spent on consumption, both for the *langarkhana* population and the "famine" areas surveyed are shown in Table X.

TABLE IX

AVERAGE NET OUTPUT AND MARKETED SURPLUS BY LANDHOLDING SIZES (DISASTER AREAS), 1974/75

Operational Landholding Size (acres)	Number of Households	Net Output (in maunds) (per households)	Net Marketed Surplus (maunds) (per household)	Marketed Surplus as Percentage of Net Output
(1)	(2)	(3)	(4)	(5)
Less than 0.5	357	2.46	—18.38	—747.16
0.5— 1.0	77	11.43	— 8.11	— 70.95
1.0— 2.5	258	23.04	— 4.03	— 17.49
2.5— 5.0	128	42.81	— 0.70	— 1.64
5.0— 7.5	26	67.50	1.62	2.40
7.5—12.5	15	128.32	12.61	9.83
12.5 and Above	8	219.90	37.75	17.17

Source : BIDS Survey of 'Famine' areas [1].

Note : Negative figures returned for marketed surplus indicates that for certain categories of cultivators, net purchases have exceeded net sales. Net output is estimated by subtracting an assumed 10% from gross output to take account of seeds, wastage, etc.

46See Bhaduri [8].

TABLE X

SOURCES OF BORROWING AND USE OF CREDIT, 'FAMINE' AND *LANGARKHANA* AREAS, 1974

Langarkhana Survey Areas	Sources of Credit (%) Institutional (1)	Friends/ Relatives (2)	Money-Lender (3)	Rich Farmer (4)	Percentage of Households Who Borrowed (5)	Credit per Borrower Households (6)	Percentage of Credit Spent on Consumption (7)
Bagerhat	5.5	24.1	44.6	25.8	95.6	551.58	100.0
Mymensingh		38.9	17.2	43.9	43.3	195.40	100.0
Dhaka		22.8	43.7	33.5	45.5	293.65	90.0
Khulna	14.6	37.7	47.7		43.6	236.28	93.7
Chilmari		20.1	39.7	40.2	47.1	108.02	94.2
Dewanganj		35.3	32.2	32.5	38.9	290.27	100.0
Rangpur		17.5	82.5		11.9	444.00	100.0
Sunamganj		47.8	10.6	41.6	42.0	355.71	100.0
Total	3.6	29.8	38.8	27.8	45.4	324.83	98.0
Four 'Famine' Villages (from Famine Survey)	4.8	28.4	27.3	24.6			88.1

Source : BIDS *Famine* and *Langarkhana* Surveys [1].

The professional moneylenders and rich peasants appeared to have been significant sources of borrowing ; and the degree of variation in the interest rates charged would reflect not only the degree of imperfections in the credit market, but also of the relative strength of motivations of these various categories of lenders. The high percentage of credit spent simply on consumption inevitably renders them indebted and forces them toward a perennial cycle of distress sales and purchases.

Since there is a direct relationship between food distribution and famines, it is important to note not only the agencies of production, but also all the parties involved in the distribution of food. Traders, as a category may significantly affect the normal distribution system (we also briefly discuss the role of government later). Traders (including the merchants and the brokers), through vertical and horizontal integration and 'barriers to entry', form oligarchic units. A study on extensive survey of the marketing agencies in Bangladesh shows that there is "a significantly high level of oligopolistic as well as oligopsonistic concentration and, on the basis of existing theories of structure, conduct, and performance, it could be labelled as an aberration of a competitive situation."[47] The above study further suggests that there is no "lack of ethics in pricing and other aspects of market conduct",[48] and that the role of traders and middlemen has become vital to the regular marketing of foodgrains.[49] While this may be true in normal times of market functioning, what one must be crucially aware of is the fact that their oligarchic nature may easily be turned around to take advantage of, and exacerbate, a food-scarcity situation.[50] It is also well known that these market functionaries can also take advantage of the 'distress' selling of rice by the small producers in seasons of lower prices.[51] In this sense, a large number of the rural population is, so to say, *denied* fair exchange.

The penetration of the usurer's capital which we have observed above, as well as merchant's capital[52] is thus in effect *reinforced* by the basic poverty levels of living of the poor. The situation is simply worsened during a famine crisis.

Wages, Employment and Extended Families

Sen [39] alleges that there was a drastic reduction in employment during 1974, almost preceding the famine. Khan [25] states that generally the jute-rice price

[47] See O. Faruk [16, p. 92].

[48] *Ibid.*, p. 92.

[49] *Ibid.*, for an account of the various services essential to the system of marketing.

[50] In one study, margin of the middleman was estimated to be 45% over and above the necessary marketing costs of a maund of rice. See [15].

[51] About 25% of the paddy sales occur at the farmyard, at prices significantly lower than the market prices. Cf. Faruk [16, p. 26].

[52] Cf. Bhaduri [8].

ratio had greatly declined in recent years, and hence there was a big shift of acreage away from jute (which is more labour-intensive than *aus*[53] with which it competes for acreage). Hence, the sharp decline in mid-monsoon employment.[54] Sen states that it was the floods that destroyed some crops, and consequently sharply reduced employment.[55]

In the absence of any direct estimates of unemployment in Bangladesh, we have adopted an indirect procedure offered by Stern,[56] based on labour-intensity of individual crops. The estimates for 1974/75 as well as for the preceding and following years are shown in Table XI. Despite its limitations, the method gives an approximate order of the magnitudes involved. The table reveals that *aggregatively*, the shortfall in employment in 1974/75 compared to the adjacent years was not very remarkable. The overall shortfall due to jute was 4.5 per cent of the total 1973/74 cropemployment, whereas *aus* (the crop affected by floods) apparently shows an increase in employment over the latter year.[57]

Thus we find that there was no dramatic employment crisis due to the famines in Bangladesh agriculture, in *aggregative* terms. The shortfall in employment, leading to fluctuations in exchange entitlements may, however, have been regional in character. As we have already noted in our schematic famine contour, such *primary* forces need not emanate from an economy-wide crisis. Although the landless labourers and the small cultivator-cum-wage earners in the affected region may have lost their "employment entitlements", it is not so apparent why these classes should have borne the major brunt of the 1974/75 crisis almost everywhere in the economy.[58] Assuming normal demand/supply conditions in the labour market and foodcrops responsive to price increases, there need not be an "employment crisis" at all, unless

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53A few high-yielding varieties of rice may, however, be more labour-intensive than jute. Cf. World Bank [45].

54Khan [25, p. 32].

55Sen [39, p. 35].

56Cf. Stern [42] ; also see [33].

57We must also note that loss of employment may be higher than aggregate returns during a particular phase of the crop cycle ; for instance, there would be loss of harvest-work if crops are lost before harvests.

58For instance, in the district of Khulna. Even in the case of Rangpur (where there were *local* disasters but a considerable number of deaths *throughout* the district) "the total 1973/74 harvest of *aman* (major rice crop) and the following *aus* (a minor rice crop harvested during the early rainy season) was around 20% *more* than that reaped in the preceding two harvests". Cf. Alamgir [2, p. 21].

TABLE XI

AN ESTIMATION OF EMPLOYMENT IN BANGLADESH CROP AGRICULTURE, 1973/74, 1974/75, 1975/76

	Crops					
	Aus	Aman	Boro	Jute	Mustard	Total
1. **Mandays Required[a] :** (average per acre)	55	60	75	98	40	
2. **1973/74 :** Acreage[b,d] (mill.)	7.68	14.13	2.60	2.20	0.44	27.05
Employment[c] (million mandays)	422.4	847.8	195.0	215.6	17.6	1698.4
3. **1974/75 :** Acreage (mill.)	7.86	13.47	2.87	1.42	0.49	26.11
Employment (million mandays)	432.3	808.2	215.3	139.2	19.6	1614.6
4. **1975/76 :** Acreage (mill.)	8.45	14.24	2.84	1.28	0.48	27.29
Employment (million mandays)	464.8	854.4	213.0	125.4	19.2	1676.8
5. **Percentage Shift in Employment[e] :** (1973/74—1974/75)	+2.34	−4.67	+10.41	−35.4	+11.4	−4.93
(1974/75—1975/76)	+6.99	+5.41	− 1.08	−11.00	— 2.08	+3.71

Notes and Sources :

[a]Mandays per acre for each crop is taken from Stern [42] and assumed constant over the three periods.

[b]Acreage figures are taken from [1 ; 20].

[c]Employment is estimated by multiplying acreage figures by respective mandays.

[d]Cropped acreage for the crops cited is more than 85% of the total cropped acreage.

[e]The plus and minus signs denote increase and decrease respectively.

the crops are substantially destroyed, or do not have an effective demand. Neither of these actually was true of the unaffected zones of the country.

The true character of "employment entitlement" must be viewed within the structure of labour market. We may simply note in our context that although there exists a wage system of employment throughout the country, the labour market

itself is a restricted one. That is to say, although there is a very large proportion actually involved, the number of workers openly available in the market, is relatively quite small. *Apparently* only the latter proportion of agricultural labour would therefore be vulnerable to the vagaries of the exchange economy. Families which are partly self-employed and self-producing would not face the brunt of a sudden employment crisis. But since a large percentage of these peasants are also partly dependent on the labour market, they would face a declining "exchange entitlements".[59]

Thus we find that whereas the majority of the landless and small peasant-cum-wage earners (constituting the predominant "destitutes" in a famine crisis) in the affected area may have suffered from failed "employment entitlements", elsewhere in the economy they are potentially threatened by fluctuations in their "exchange entitlements". There is, however, a more fundamental consideration. It may be pointed out that while the wage rates are an important consideration, what one must note is the total *earnings* of the above families. That is to say, total mandays of employment available to these families is as crucial. This feature is significant because even in non-famine periods, a large proportion of workers in terms of total mandays of employment, are actually severed from the production/employment process itself. Such a stituation may easily accentuate during a famine.

While the wage rate may rise with the prices (adjusting through a lag), or perhaps be fixed by a minimum wage legislation (if at all feasible in the rural sector), the amount of mandays of employment, which is equally important, cannot be so modified, at least in the short-run. The latter is dictated by the technological conditions and the seasonal structure of employment. But even if we assume a rise in the rates of wages (technological constraints still limit the rates), the seasonal structure of production in itself may still contribute to the vulnerability of the rural population.

In a situation where there is "*neither* the protection of the family system of peasant agriculture, *nor* the insurance of unemployment compensation—*nor*, of course, the guarantee of the right to work at a living wage",[60] the poor labouring classes may well seize upon expansion of family size as a form of 'social security'. Table XII, from the *Ldngarkhdna* survey shows that except the highest landholding (operational) category, all, who have turned destitutes, have a per capita landholding well below one acre. It must be observed that the extended family size which, in normal

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[59]In a *pure* peasant economy [2], with no, or very little, exchange, a famine would necessarily come from factors other than a crisis of exchange/employment entitlements.

[60]Cf. Sen [39, p. 56].

times, may hold out a sense of security, can at the same time expose the precarious nature of the level of living of the poor.[61]

The decision at the individual level of the poorer agricultural classes to raise large families causes major macro-economic problems, affecting longterm growth and the level of living of the poorer sections themselves. Such decisions are almost consciously taken,[62] and this is in contrast to what Joan Robinson states as "differences

TABLE XII

AVERAGE HOUSEHOLD-SIZE (BY LANDHOLDING CATEGORIES) OF *LANGARKHANA* DESTITUTES, BANGLADESH, 1974

Landholding (operational acres)	Number of Household (1)	Average Size of Household (2)	Land per Capita (3)
.5	632	4.9	0.03
0.5—1.0	161	5.4	0.13
1.0—2.5	437	6.1	0.28
2.5—5.0	362	7.8	0.45
5.0—7.5	109	9.5	0.63
7.5—12.5	53	11.7	0.79
12.5+	20	12.8	1.36

Source : BIDS, *Langarkhana* Survey [1].

in luck or diligence and in the accidents of family life, bringing about differences in the relation of consumption to production for various individuals".[63] In this latter context, one may recall the FAD view, which even though tenuous at the aggregate level, may be regarded partly true as a group-specific phenomenon.

61It is natural that such a strategy should prove rather elusive. This is true not only of the pure agricultural labourers, but also the small peasants who believe that with a larger number of workers they can either hire out labour for more earnings, or hire in some more land for further cultivation. But while their families may tend to grow larger, their total income may not.

62"Gurudev Singh expressed the hope that his second son would soon be married and that his two daughters-in-law would bear him many grandsons so that in the near future they could accumulate enough savings to buy more land", Mamdani [29, p. 85].

63See. J. Robinson [38, p.48].

The "Counter-Forces" and Implications for Distribution

While we have examined some specific structural features that help keep the spectre of famines ever alive in a low income economy, there are certain social and economic factors which may, for a large proportion of the population, apparently tend to mitigate the unequal *primary* distribution of income. These operate in the complete absence of state provision in the rural sector ; for instance, the 'security' sustained by an extended family, reliance on the money-lenders (rich peasants or traders), sales of assets, etc. While the first of these is a long-term feature, the role of the other two forces is accentuated when a famine crisis increases the size of the "tail of the distribution."

It is clear that the issue of starvation is related to the nature of distribution, as well as *access* to food for consumption. The latter may be observed in terms of either a *physical* access arising from own-production (or received kind-rent kind-usury) or by access through *exchange*, provided one has the current period purchasing power (current income, borrowing, dissaving, etc.). We have attempted to show how the poor and more vulnerable sections of the society may fail to get an access to food-grains at the time of a crisis. Where a household's current income cannot earn an access to food, there is a great increase in borrowing for consumption (see Table X) and also substantial dissaving. In fact, the *lag* between the time when current income ceases to flow to a family and eventual starvation is largely determined by transference to inferior goods, extent of borrowing, dissaving, begging and even thefts. Also, a client/pätron relationship existing in various forms within the social structure may further contribute to this lag. Thus the degree of 'staying power' and the fact that a famine is only an accentuation of the general pre-famine conditions in the economy (and thereby causing more starvation and deaths) are perhaps attributable to this lag.

Table XIII states that the majority of the *langarkhana* destitutes had to sell some assets. Sale of assets in the form of land, plough cattle or other agricultural implements by the destitute farmers who constitute a large percentage of famine victims, inevitably leads to a permanent deterioration in their economic conditions. In the process, there is a further growth in landlessness and an increase in the inequality of distribution of landholding (and also income). The BIDS Survey of 'famine' and 'non-famine' areas provides some magnitudes of the phenomenon. Table XIV reveals that the small landowners during the period preceding the famine have been selling their land quite substantially, and even more during the crisis itself. Thus, the short-term breakdowns in 'normal' economic relationships which occur in the wake of a famine, in effect give way to permanent decline in the level of living of the rural poor. While a larger number of people are now pauperised and forced into

increasing indebtedness, there is evidently every reason for the process of money-lending on exploitative terms, to gain momentum. Returns to usury being very

TABLE XIII

DISTRIBUTION OF *LANGARKHANA* INMATES SELLING DIFFERENT ASSETS

Area	Percentage Distribution of Households				
	Sold Land	Sold Land and other Assets	Sold other Assets	Did not Sell any Assets	Total
Bagerhat	5.49	15.38	62.64	16.48	100.00
Mymensingh (1)	4.12	11.34	64.95	19.59	100.00
Dhaka	1.98	17.82	51.49	28.71	100.00
Rangpur (1)	5.88	18.63	59.80	15.69	100.00
Rangpur (2)	4.95	15.84	72.28	6.93	100.00
Mymensingh (2)	1.05	23.16	69.47	6.32	100.00
Sylhet	5.00	6.00	16.00	73.00	100.00
Khulna	9.90	0.99	21.78	67.33	100.00
Total	**4.82**	**13.58**	**52.03**	**29.57**	**100.00**

Source : BIDS Survey of *Langarkhanas* [1].

TABLE XIV

LAND (OWNERSHIP) SOLD BY VARIOUS LANDHOLDING GROUPS

Landholding Groups (acres)	Percentage of Owned Land Sold by Households		
	1972	1973	1974
Less than 1	39	29	54
1 to less than 2	19	17	24
2 to less than 5	12	18	12
5 and Above	10	10	11

Source : BIDS Surveys of eight villages : quoted in [2, p. 108].

Note : The landholding groups refer to the seller-households.

high (even in normal times), there is thus an inherent tendency for resources to be diverted away from productive investment in agriculture by the potential investors.

These carry grave implications for future growth—on top of the physical loss of investible resources coming in the wake of floods and other natural disasters.[64]

VI. FOOD DISTRIBUTION AND ROLE OF STATE

The role of the government during a famine crisis essentially consists of (i) measures to put purchasing power into the hands of the famine destitutes (through 'gruel kitchens' or monetary compensations) ; and (ii) measures to reduce the fall in the supply of rice when there is a shortage of food (through imports and releases from stock). These are immediate measures and we have emphasized that these may fail to cope with the distress situation when the primary forces of famine give way to the secondary forces. In this regard, one must also note the general strategy of the government in distribution of food in the country.

Apart from the various market imperfections, the class structure, personalized relations and bureaucracy which have put the rural poor of Bangladesh at bay, the role of the government also appears to carry an implicit bias against them.

The government intervenes in the distribution of foodgrains through the rationing scheme, both in the urban and rural areas. There is an obvious urban bias in the distribution scheme of the government which controls more than nine-tenths of all imported foodgrains.[65] This can be seen from Table XV. Apart from the quota restricted for the urban civilians, there is separate rationing for most public

TABLE XV

DISTRIBUTION OF FOODGRAINS THROUGH GOVERNMENT RATIONING

	1972/73	1973/74	1974/75	1975/76	1976/77
Rural Population	60.8	45.0	32.8	29.7	22.8
Urban Population	17.8	29.1	26.7	20.9	24.09
Relief	7.9	3.0	9.1	13.6	10.0
Public/Private Sector Employees	13.5	22.9	31.4	35.8	42.3
Total	100.0	100.0	100.0	100.0	100.0

Source : [15].

64It was officially reported that as many as 47,000 cattle-heads were lost during the floods preceding the 1974/75 famine. See [17].

65See [15].

and private sector employee also in urban areas. The total share of the urban population in the government's rationing in 1974/75 was nearly 60 per cent. Thus, while the real urban wages during the famine period had also appreciably declined, the urban poor did not fare as severely as the rural poor. Apart from an assured supply of foodgrains, they had at times to pay only 25 per cent of what one had to pay in the free market for purchasing a unit of rice.

A rationing schedule also exists for the rural areas, besides the scheme of 'relief' which is mostly contingent on famines, or severe food-scarcities. There has been a sharp decline in the government's proportionate quota of rationing for the rural population, from 60.8 per cent to 22.8 per cent, over the period 1972/73 to 1976/77. Besides, such rationing (given twice a month) is very limited, and does not cover the entire rural poor either regionally or individually within a particular region. The proportion of rural and urban rationing *vis-a-vis* the sectoral populations is a sufficient indicator. Moreover, the situation is further worsened by the government's distribution of dealership quotas to a class of essentially 'non-traders', who make windfall profits from selling the foodgrains in the open market.[66] Evidence of such corruption, and the use of dealership quotas for political patronage, have been reported in various studies.[67] Thus, in all probability, the poorer sections of the rural population are almost unaffected by the government's rationing scheme. The point to note here is that although there were innumerable deaths occurring in the Dhaka streets during the 1974/75 famine, almost all belonged to the rural sector, and hardly any from the city itself.

VII. CONCLUSION

In this study we have attempted a critical evaluation of the major explanations of famines in low-income agrarian economies. We have applied these expositions to the recent 1974/75 famine in Bangladesh, and have observed that none of these offer a universal or aggregative answer. This does not imply that these tools are either redundant or insignificant. Simply, the extent of their applications is partial in nature and the disaggregation has been seen to be contingent on the nature of the economy itself.

There does not exist any single theory of famines. In the absence of such a theory, we have tried to examine the framework of famines with reference to the structural explanations of poverty in Bangladesh—the central proposition being that famines

66See [18] on the economic situation during 1974/75.

67"The local dealer in one area received the job because his father-in-law had been head of the local administrative body, the union council". Hartmann and Boyce [23, p.5].

are fundamentally an extension of the poverty-themes that pertain to the country. In fact, the concept of poverty in countries like Bangladesh takes on added connotations. It is no longer simply a relative concept, as in the more developed economies ; it is almost indistinguishable from the concept of modern-day famines. Features that are characteristic of one are also applicable to the other, in equal measure.

Our analysis suggests that, given the present agrarian structure, the short-term breakdowns in economic relationships that occur in the wake of famines can, in effect, aggravate the vulnerability of the rural poor, leading to a long-term worsening relative and absolute impoverishment.

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Appendix

TABLE A.1

INDICES OF DAILY WAGES OF AGRICULTURAL LABOUR, PRICE OF RICE, AND EXCHANGE RATES, BANGLADESH : OCTOBER 1973—JUNE 1975

(Index : 1969/70=100)

Period	(1) Daily Wage	(2) Wage Index	(3) Wholesale Price of Rice (Tk.) (per maund)	(4) Rice Price Index	(5) Labour/Rice Exchange Rate
1969/70 Monthly Average	2.91	100.0	39.50	100.0	100.0
1973					
October	5.85	201.0	93.90	237.7	84.6
November	6.00	206.2	90.20	228.4	90.3
December	6.32	217.2	83.22	210.7	103.1
1974					
January	6.22	213.8	91.92	232.7	91.9
February	6.36	218.6	78.85	199.6	109.5
March	7.17	246.4	113.60	287.6	85.7
April	8.22	282.5	137.36	347.8	81.2
May	8.72	299.7	138.83	351.5	85.3
June	8.26	283.9	149.69	379.0	74.9
July	8.61	259.9	148.88	376.9	78.5
August	8.82	303.1	179.50	454.4	66.7
September	8.80	302.4	211.53	535.5	56.5
October	8.64	296.9	263.06	665.0	44.6
November	8.39	288.3	227.13	575.0	50.1
December	8.79	302.1	223.76	566.5	53.3
1975					
January	8.91	306.2	242.08	612.9	50.0
February	9.16	314.8	270.38	684.5	46.0
March	9.79	336.4	263.89	668.1	50.4
April	9.24	317.5	239.48	606.3	52.4
May	9.90	340.2	206.24	522.1	65.2
June	9.59	329.6	203.68	515.7	63.9
1976					
January	9.01	309.6	113.63	287.7	107.6

Source : *Monthly Statistical Bulletins* (various issues). Also [1].

TABLE A.2

EXCHANGE RATES (INDICES) OF VARIOUS COMMODITIES *VIS-A-VIS* RICE IN BANGLADESH, OCTOBER 1973—JUNE 1975

(Index : October 1973=100)

Period	Fish	Potato	Cloth	Milk	Mustard Oil
1973					
October	100.0	100.0	100.0		100.0
November	88.6	115.9	104.0		112.2
December	91.2	131.9	104.0		124.3
1974					
January	80.1	107.5	101.4	100.0	125.2
February	79.2	84.9	101.1	79.7	126.9
March	72.4	66.7	97.5	78.2	124.6
April	73.9	68.0	77.4	78.1	104.9
May	83.2	68.4	75.4	77.4	108.6
June	87.0	82.7	66.3	76.4	120.5
July	82.7	89.9	73.2	80.5	126.5
August	74.6	83.9	58.1	82.7	111.4
September	60.4	71.4	46.7	77.1	107.5
October	46.1	57.6	41.1	77.2	102.6
November	40.6	56.7	48.7	68.8	113.1
December	46.4	84.3	46.6	75.5	129.2
1975					
January	37.5	36.9	38.4		117.1
March	37.4	33.0			106.5
June	56.3	84.8			116.6
1976					
January	103.5	81.1	57.2		144.2

Sources : 1. *Statistical Yearbook of Bangladesh*, 1975.
2. *World Bank : Current Economic Situation*, 1977.
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Note : Exchange Rate for milk has been calculated with milk price index of January 1974=100, as the prices for the preceding months were not available.

Repayment of Loans to Specialised Financial Institutions in Bangladesh: Issues and Constraints

by

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AND

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Current official policy in the industrial sector is directed towards building up private entrepreneurship through fiscal concessions, liberal provision of public resources and disinvestment of particular nationalised enterprises. In these circumstances it is essential to appraise the efficacy with which the private entrepreneurs have thus far handled public resources. This paper examines one aspect of this performance, the repayment of loans to public financial institutions (BSB and BSRS) by the private entrepreneurs. The results indicate that the loan repayment performance of private enterprises to both BSB and BSRS has been poor, with considerable accumulation of overdues in payment liability and its growth over time. This accumulation and build up of overdues is pervasive amongst all enterprises. Poor repayment performance does not differentiate between the size of enterprises, its location or the entrepreneural class as a whole. Given the widespread nature of the default it is essential to seek a fuller understanding of the circumstances contributing to the poor repayment performance of private entrepreneurs in Bangladesh. This will provide the basis for a review of the validity and efficacy of the policy of channelling public resources and denationalisation of enterprises into private hands.

I. INTRODUCTION

This paper on the repayment of loans to the specialised financial institutions of Bangladesh is part of an ongoing study of the Bangladesh Institute of Development Studies on The Role of Financial Institutions in the Development of Entrepreneurship in Bangladesh. This study has been designed to review official policy towards the deployment of public resources in the development of private entrepreneurship in Bangladesh. The study itself is still in its preliminary stage both as to the finalisation of the design and the generation of primary data. The present paper is therefore derived from a review of data which is currently available within the specialised financial institutions relating to their lending operations.

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The idea of putting out a preliminary paper on the loan repayment performance of the private enterpreneurs is somewhat premature and not fully incorporated within the analytical framework of the wider study. The objective of this paper has thus been to provide some basic information on this subject since the issue of loan repayment, or the lack of it, has acquired some urgency within the perspective of policymakers in Bangladesh. There is also some evidence of concern amongst some of the aid donors who have made a significant financial contribution to sustain the lending programmes of these institutions.

Furthermore since the thrust of current official policy is directed towards building up private entrepreneurship through fiscal concessions, liberal provision of public resources and disinvestment of particular nationalised enterprises, it is appropriate to appraise the efficacy with which the private sector has thus far handled publicly provided resources. Whilst such a review has a variety of measurable components, the capacity to service loans from public institutions would appear to be an important yardstick of performance.

There are three principal financial institutions currently engaged in lending public funds to private entrepreneurship in Bangladesh. The Bangladesh Shipla Bank (BSB) and the Bangladesh Shilpa Rin Sangstha (BSRS) provide loan finance in foreign and local currency to potential borrowers in both the public and private sector. The Investment Corporation of Bangladesh (ICB) is of more recent origin having entered the field from 1975/76 with a view to provide equity support to private entrepreneurs. Whereas the ICB has provided significant financial support over the last eight years in the development of entrepreneurship, they are primarily engaged in the provision of venture capital and are hence not immediately involved in recovering payments against their investments in particular enterprises. Our study will therefore focus more exclusively on repayments to BSB and BSRS. These are the two institutions which have been confronted with a considerable build up in outstanding dues and therefore merit special attention.

It might be mentioned here that the nationalised commercial banks also carry a sizeable overhang of accumulated claims on borrowers. Whilst these banks largely cater to lending on current account they have on occasion given out some term loans or directly provided bridge financing or guarantees to particular private entrepreneurs to supplement their borrowing from the term lending institutions. There is some evidence from discussion with bankers, that some part, if not a sizeable part of the owner's equity which is put up as matching finance for their term borrowing is underwritten by the commercial banks. To this extent a build up in liabilities to the commercial banks is an extension of the problem of providing funds from

public institutions to develop private entrepreneurship. As yet however the data on commerical borrowing is insufficiently disaggregated to provide quantitative testimony to this hypothesis. Since borrowings from the commercial banks will be pursued more fully at a later phase of this study, we will exclude the build up in term liabilities in this sector.

II. THE CHANGING DIRECTION OF PUBLIC POLICY

In Table I we present data on the volume and structure of resources committed by the three public financial institutions specialising in term lending. These cover BSB, BSRS and ICB. Whilst ICB has been excluded from the purview of this paper we have included their resource commitments in the aggregate of financial resources extended towards entrepreneural development in order to provide a clearer perspective on the flow of term financing from public financial institutions.

Table I brings out that as between December 1971 and June 1982 a total of Tk. 10,483 million was sanctioned by these three institutions for financing investment. Of the Tk. 10,483 million sanctioned, 51% was provided by BSB, 43% by BSRS and 6% by ICB. The share of ICB represents the equity component of public financial investments, so that the aggregate of loan finance for which repayment is due comes to Tk. 9,859 million.

Of the aggregate of public funds made available, 93% was sanctioned to the private sector and 7% to the public sector. Of this amount, some Tk. 4,152 million or 42% had been disbursed by end-June 1982. Of the total amount of disbursed funds, 92% had been used by the private sector and 8% by the public sector. This suggests that the public sector has been moderately more expeditious in utilising funds made available to it than the private sector. However, no conclusions should be drawn from data presented at such a level of aggregation.

Whilst it is evident that in the last decade the term lending institutions have primarily served the private sector, this was not always the case. In Table I we have disaggregated the data as between 1971-75 and the period subsequent to this. Since there was a major regime change in August 1975 which tends to be associated with a discernible redirection of public policy towards the private sector, this intertemporal watershed has some analytical relevance.

The data in Table I establishes that upto June 1975, 78% of all resources sanctioned and disbursed went to the public sector and 22% to the private sector. In sharp contrast, between 1975 and 1982, 96% of funds were made available to the private sector, though only 93% of funds disbursed went to this sector.

TABLE I

TOTAL VALUE OF FUNDING PROVIDED BY BSB, BSRS AND ICB, 1971-82

(in Tk. Million)

PERIOD	SANCTION[a]			DISBURSEMENTS[b]		
	Public	Private	Total	Public	Private	Total
A. Amount						
1971/72-1974/75	363.8	104.3	468.1	83.4	22.9	106.3
1975/76-1981/82	375.5	9638.6	10014.1	285.0	4003.3	4288.3
1971/72-1981/82	739.3	9743.9	10483.2	368.4	4026.3	4394.7
B. Percentage[c]						
1971/72-1974/75	77.7(49.2)	22.3(1.1)	100.0(4.5)	78.4(22.6)	21.6(0.6)	100.0(2.4)
1975/76-1981/82	3.7(50.8)	96.3(98.9)	100.0(95.5)	6.6(77.4)	93.4(99.4)	100.0(97.6)
1971/72-1981/82	7.1(100.0)	92.9(100.0)	100.0(100.0)	8.4(100.0)	91.6(100.0)	100.0(100.0)

Note : [a]For ICB, commitments, instead of sanctions, were taken.
[b]For ICB, disbursement figures uptill 31-3-82 were available.
[c]Percentage figures within parentheses are column percentages. Those outside parentheses are row percentages.

Source : Computed from Tables 1.I & 1.VII in [1].

This dramatic about-face in the direction of public financial resource transfers after August 1975 explains the heavy weightage in the cumulative figures for loans sanctioned and disbursed after mid-1975. There was some acceleration in the provision of funds after 1975 to the extent that 95% of all funds sanctioned were provided during 1975-82. This acceleration was again significantly more apparent for the private sector. Thus 99% of all funds sanctioned to the private sector were made available after mid-1975. In contrast some 49% of sanctions to the public sector were made over three years 1972-75 in contrast to 51% provided over the next 7 years. This suggests that on a *pro rata* basis there was an absolute decline in annual lending to the public sector.

From this evidence it would be legitimate to conclude that upto mid-1975 public financial institutions were primarily servicing the commercial end of the public sector. The share of the private sector reflected both the resource constraints of that period as also their diminished state in the economy. Following the nationalisation policies of March 1972, only 8% of fixed assets in the modern manufacturing were left in the private sector. This weightage in asset ownership was thus reflected in the lending programmes of the financial institutions. During 1972-75 the private sector thus became the main casualty of limited resources so that at the margin the main burden was carried by this sector.

As of mid-1975 this trend changed drastically to the point where it can now be claimed that the public financing institutions are more or less exclusively committed to finance the private sector. This reorientation in the policy of the lending institutions was institutionally supported by the emergence of the Investment Corporation of Bangladesh which was established as recently as October 1976. Its creation was itself a reflection of the turn around in public policy. Upto mid-1975 there was a disinclination to commit equity support to the private sector. Two such institutions inherited from Pakistan days, the Investment Corporation of Pakistan (ICP) and the National Investment Trust (NIT) had, as an act of policy, been disbanded and their personnel and resources were absorbed into the BSB and BSRS. It was assumed that private entrepreneurship only needed loan capital to stimulate enterprise and commit resources.

Since by an act of public policy a ceiling of Tk. 25 million had been imposed on all new investments by the private sector, the need for bridge finance to cover this limit was initially seen to be somewhat redundant. Whilst this policy was reversed in July and the ceiling raised upwards to Tk. 30 million, the effect of this policy had not taken root till mid-1975. However, the redirection of public policy led to a progressive rise in the ceiling till it was finally eliminated in the Investment

Policy of 1978. No ceiling now remains to constrain the growth of private enterprise nor are there any sectorally exclusive areas to contain their spread.

In these circumstances the need for public resources to finance more ambitious investment projects in the private sector soon ran up against the limitations in the equity base of most private entrepreneurs. Thus the rising commitment of loanable funds for investment needed to be supplemented by public commitments of risk capital. This provided the rationale for the creation of the ICP in erstwhile Pakistan and its reincarnation as ICB after 1976. Whether in effect there was an actual constraint in the supply of risk capital or in fact private entrepreneurs were disinclined to risk their equity and thus preferred to pass the risk on the public sector will be separately discussed in the later phases of the fuller study.[1]

III. EVALUATING PUBLIC LENDING POLICY : THE METHODOLOGY

The re-orientation of public policy which has resulted in this massive deployment of public financial resources towards the development of private entrepreneurship provides the focus of our study. The assumptions behind this policy and the results and implications arising out of this redirection of public resources will again be reviewed within the study but at a subsequent stage. The review of the repayment performance of the private entrepreneurs within this context provides one dimension in the evaluation of the efficacy of this particular act of policy. It should however be kept in mind that repayment performance is by no means the only yardstick by which a major policy shift such as this should be judged. Indeed poor repayment reflects as much on the effectiveness and operational viability of the public financial institutions as it does on the viablility of public policy towards the private sector. The institutional role and performance constraints afflicting the financial institutions will therefore constitute yet another component of our study. The findings presented below on repayment are therefore to be seen as basic information which can then be exposed to interpretation and analysis within the wider analytical design of this study.

In our review of repayment performance we provide aggregated data for BSB and BSRS and disaggregated data for the respective institutions. The data is structured to provide information on the repayments fallling due within a year and the

[1]Such a study will need to look at the actual sources and supply of private capital and the identifiable channels for its investment. This will enable us to see how much of the actual investment in enterprises set up with support from public institutions is actually provided through the owners' equity.

the actual repayments realised by the financial institutions against what falls due. The payments due duiing the year incorporte the outstanding dues accumulated over the previous years and the current dues. The sum of these dues are classified as 'the total recoverable amount' during the year. Actual payments made during the year are then related both to the payments due during the year as well as to the total recoverable amount. The latter figure provides some insight into the cumulative build up in the debt overhang as a result of repayments falling shoit of the total recoverable amount over the years.[2]

A review of the data published by the financial institutions provides some measure of the mounting extent of the debt overhang. Their figures however do not provide any quantitative perspective to the problem. Indeed the published figures tend to obscure the extent of the build up in debt liabilities due from the borrowers largely because of a regular policy of debt rescheduling and rephasement of loans practised by both BSB and BSRS. The implications of this policy are not adequately captured in the published data which understates the extent of the overdues carried over to the next year by the amount of the rescheduled debt. At the same time actual figures for repayment tend to be overstated.

It would appear that book-keeping procedures within those institutions make it necessary to continue disbursement of loans to a borrower even when there is a default on outstanding dues. This contradiction is partially resolved in the account book by keeping back a part of the new disbursement and adjusting it against the outstanding debt. This provides for an inflated figure for the repayment performance of the borrower and for the actual disbursement of loanable funds. Casual readers of the annual reports of these institutions, who frequently include top policy-makers, will thus be inclined to accept these inflated figures at their face value since they will have an inadequate insight as to how these figures were aggregated.[3]

With these caveats in mind the data on loan repayments has been analysed in this paper with a view to identifying the extent to which loans are being repaid. The review traces the repayment performance over the years in order to provide some perspective on the accumulation of liabilities. It then attempts an analysis of repayment performance to see if there is any discernible difference in the performance of various categories of borrowers. Within this paper, borrowers have been categorised as follows :

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[2]A fuller statement of the concepts and methodology for computing the figures in the subsequent table, and the data sources is provided in Annexure 4 of [1].

[3]Annexure 4 of [1] more comprehensively brigns out the nature and implications of this policy of the financial institutions to ease the debt burden.

6—

(i) *Location of the Enterprise*

We have reviewed performance in relation to the location of the enterprise. This was intended to assess whether loanees from more developed or urbanised areas enjoyed a better capability of servicing loans. The extent of area disaggregation was limited to the four principal administrative divisions of Dhaka, Chittagong, Khulna and Rajshahi which traditionally also serve as the units of territorial differentiation for levels of development within Bangladesh. We have however taken cognisance of the fact that even within these divisions the metropolitan centres have become the focal point of economic activity where large scale industry has tended to concentrate. We have therefore disaggregted enterprises located in the metropolitan centres of Dhaka, Chittagong and Khulna to see whether location in the more developed areas affects repayment performance.

(ii) *Sector of Economic Activity*

Here we attempt to analyse how far the specific circumstances of particular industrial sectors constrain the relative performance and debt servicing capacity of enterprises in a particular sector.

(iii) *The Size of the Loans*

This serves as a proxy for size of the enterprise and is designed to provide some indication of whether big or small borrowers are more likely to run into repayments difficulties. Of course the size of the loan need not reflect the size of the investment if in fact there is a sizeable equity contribution by the owner to the cost of the project. However a review of all loan applications suggests that this is very rare, so that the size of the loan tends to be uniformly proportionate, irrespective of the size of the loans. The assumption that the loan size reflects the scale of the enterprise thus appears to be valid.

(iv) *Operational Status*

The operational status of the enterprise distinguishes between enterprises which are already commissioned and generating a cash flow and those which are still under construction and yet to generate revenue.

The above categorisation of enterprises deemed as having a potential to influence repayment is by no means complete. In practice, a variety of variables influence repayment. To capture the relative weightage of these variables would require the development of a behavioural model explaining repayment performance. The model would need to, *inter alia*, take into account such variables as the

entrepreneur's background, experience and financial circumstances, appropriateness of the choice of technology, the managerial capability, the market regime, the access to inputs, including foreign exchange, and the overall economic and political environment. These aspects of entrepreneurial behaviour will be reviewed during the course of the study. These aspects of entrepreneurial behaviour may be expected to influence capacity utilisation, levels of output and profitablity. These measures of performance would in turn influence repayment performance.

It may thus be reasonable to infer that a poor repayment record is likely to correspond to poor performance indicators which in turn are derived from factors which we have identified as constraining entrepreneurial behaviour. In the absence of such information however it would be inappropriate to generalise about the causes behind poor repayment. However evidence of poor repayment record would at this stage certainly give grounds to indicate that all is not well in individual enterprises and with private industry at large. In such circumstances policy initiatives which seek to divert public resources and assets into private hands would appear to be somewhat premature until some clear understanding of the roots of the poor repayment performance is at hand.

IV. ANALYSIS OF LOAN REPAYMENT PERFORMANCE

The Extent of Debt Service Liabilities

We have observed that a total of Tk. 9,859 million has been sanctioned as loans from BSB and BSRS between 1971/72-1981/82. Of this Tk. 4,152 has been disbursed. Table II brings out that of the total loans sanctioned, Tk. 2,889 million, or 29.3%, has so far been recovered. If we relate recovery to disbursed loans then this comes to 69.6%. This has left an outstanding loan portfolio of Tk. 5,204 million. This indicates that as of 30-6-82, of the total loans sanctioned, 52.8% has yet to be repaid. Against the outstanding amount to be repaid, Tk. 1,640.3 million or 31.5% is classified as overdue. This is a cumulative figure of payments for both principal and interest, which have fallen due over the years.

Table II brings out that the larger share of the outstanding loan portfolio vests with the private sector. Whereas the private sector accounts for 93% of sanctions and 91% of disbursements as of 30th June, 1982, it accounts for 72.7% of the outstanding loan portfolio. This is due to the fact that the outstanding loans have a component of loans carried over from the pre-1971 period. The bulk of the earlier lending was directed to enterprises now in the public sector. Since all figures for sanctioned loans relate to the post-1971 period some discrepancy in the rates as

between the public and private sector, for loans sanctioned and loans outstanding may be expected.

TABLE II

AMOUNT RECOVERED, OUTSTANDING AND OVERDUE IN RELATION TO AMOUNT SANCTIONED AND DISBURSED (BSB+BSRS)

(In Tk. Million)

	Public	Private	Total
1. Sanction	739.3	9,119.6	9,858.9
2. Disbursement	368.4	3,784.0	4,152.4
3. Recovery	2,209.7	679.3	2,889.0
4. Outstanding	1,420.6	3,783.1	5,203.7
5. Overdues (official)	535.5	1,104.8	1,640.3
7. 3 as % of 1	298.9	7.4	29.3
8. 3 as % of 2	599.8	17.9	69.6
9. 4 as % of 1	192.2	41.5	52.8
10. 4 as % of 2	385.6	99.9	125.3
11. 5 as % of 4	37.7	29.2	31.5

Note : Figures are cumulative from 17-12-71 to 30-6-82.

Source : Computed from Tables II and IIb in [1].

Since 1971 however repayments of loans by the private scector account for 7.4% of sanctions to the sector and 18% of disbursements. By way of contrast, the public sector has paid off 298.9% of sanctions and 599.8% of disbursements. It therefore follows that the public sector has been largely paying the loan liabilities inherited from the pre-1971 period. In contrast the overdues of the private sector are correspondingly higher than for the public sector. Thus as of end-June 1982, 72.7% of loans outstanding and 67.3% of loans overdue are held by the private sector.

In Tables IIa and IIb we present disaggregated figures to distinguish between the performance of BSB and BSRS. It would from these tables appear that whereas BSRS accounted for 46.1% of sanctions and 47.6% of disbursements, it holds 49.93% of the portfolio of outstanding loans. This again would appear to owe to the fact

that compared to BSB, BSRS carried over a larger portfolio of inherited loans from prior to 1971. However, it may be noted that BSRS's rate of recovery of loans stands at 30% of sanctions compared to 29% for BSB. As a result, as against its outstanding loan portfolio 34% is overdue, compared to 29% for BSB. Thus as of 30 June 1982, 49.9% of outstanding loans and 54.0% of overdues are owed to BSRS. This would appear to suggest that if we make allownances for the larger size of the inherited loan portfolio for BSRS the recovery record is not significantly dissimilar to that of BSB.

TABLE IIa

AMOUNT RECOVERED, OUTSTANDING AND OVERDUE IN RELATION TO AMOUNT SANCTIONED AND DISBURSED (BSB)

(In Tk. Million)

	Public	Private	Total
1. Sanction	459.1	4,850.7	5,309.8
2. Disbursement	126.1	2,049.3	2,175.4
3. Recovery	1,007.9	521.3	1,529.2
4. Outstanding	582.4	2,022.9	2,596.4
5. Overdues (official) (as on 30-6-82)	155.9	598.0	753.9
6. Overdues (actual) (as on 30-6-82)	647.1	964.7	1,611.8
7. 3 as % of 1	219.5	10.7	28.8
8. 3 as % of 2	799.3	25.4	70.3
9. 4 as % of 1	126.8	41.7	48.9
10. 4 as % of 2	461.8	98.7	119.4
11. 6 as % of 1	140.9	19.9	30.3
12. 6 as % of 2	513.2	47.1	74.1
13. 6 as % of 4	111.1	47.7	62.1
14. 5 as % of 4	26.7	29.6	29.0

Note : Figures are cumulative till 30-6-82

Source : Computed from Tables 1.II, 1.VIII and 2.I in [1]

TABLE IIb

AMOUNT RECOVERED, OUTSTANDING AND OVERDUE IN RELATION TO AMOUNT SANCTIONED AND DISBURSED (BSRS)

(In Tk. Million)

	Public	Private	Total
1. Sanction	280.2	4,268.9	4,549.1
2. Disbursement	242.3	1,734.7	1,977.0
3. Recovery	1,201.8	158.0	1,359.8
4. Outstanding	838.2	1,760.1	2,598.3
5. Overdues (official)	379.7	506.8	886.5
7. 3 as % of 1	428.6	3.7	29.9
8. 3 as % of 2	496.4	9.1	68.8
9. 4 as % of 1	299.2	41.2	57.1
10. 4 as % of 2	345.9	101.5	131.4
11. 5 as % of 4	45.3	28.8	34.1

Note : Figures are cumulative till 30-6-82

Source : Computed from Tables 1.III, 1.IX and 2.3 in [1].

The Repayment Record of Private Enterprise During 1981/82

For purposes of analysis which focuses on the policy of developing private entrepreneurship, it is apparent from Table II that the repayment performance of the private sector is somewhat unsatisfactory compared to the public sector. Moreover, the official figures conceal the actual recoveries from the private sector due to the policy of readjustments discussed earlier. However, the outstanding loan portfolio is accurate enough since the updated figures for end-June 1982 incorporates the rescheduling of debts which is continuously undertaken by the Banks. The figures used in this table thus present a consolidated figure of the extent of the liability owed by private entrepreneurs to the Banks. The end-product of this build up in the size of the debt liabilities of the private sector is presented in Table III. This shows that at the end of June 30, 1982, some Tk. 1,469 million was overdue as payments from the private entrepreneurs. This comes to 86.3% of what is recoverable from them over this period. This payment has built up in the last year. Thus during 1981/82, cash payments amounted to Tk. 233.5 million. This comes to only 43.1% of what fell due during the year. Considering that at the beginning

of the financial year as of 1 July 1981, Tk. 1,161.8 was overdue, during 1981/82, overdues increased by 26.5%.

TABLE III

DUES (ADJUSTED) & REPAYMENT : (BSB+BSRS) 1981/82

(In Tk. Million)

	Public	Private	Total
(a) Overdues at beginning of year	975.8	1,161.8	2,137.6
(b) Amount fallen due during the year	288.2	541.2	829.4
(c) Total recoverable amount	1,264.0	1,703.0	2,967.0
(d) Cash payment	433.9	233.5	667.4
(e) Overdues at year end	830.1	1,469.5	2,299.6
(f) Cash payment as % of dues	150.6	43.2	80.5
(g) Cash payment as % of total recoverable amount	34.3	13.7	22.5

Source : Computed from Tables 2.2. & 2.3 in [1].

This point about the build up in overdues is brought out because there was some expectation that the introduction of Martial Law, as of 24 March 1982, would lead to some step up in the rate of recovery during the last quarter of 1981/82. This expectation originated in statements by the new regime about the problems of build up in overdues to the banks and the indication that such a development was symptomatic of the administrative laxity of erstwhile administrations. Indeed the new regime set up a special Martial Law tribunal to specifically investigate the repayment records of the public sector financial institutions. Another such tribunal was set up to examine the extent and problems related to the utilisation of public funds made available to set up specific enterprises.[4]

In order to test the validity of this expectation that repayments would improve we examined the actual cash payments received by BSB during the months of April-June, 1982, which coincides with the first three months of the incumbency of the

[4]These tribunals were set up on 17th April 1982 and 13th May 1982 respectively and asked to submit their reports by 30th April 1982 and 30th June 1982 respectively.

new regime and the last quarter of the financial year 1981/82. The results are presented in Table IV. The table compares the proportion of total payments which accrued during the last quarter of 1981/82 to payments throughout the year with the corresponding proportions of the previous three financial years. The presumption would be that if there was a discernible acceleration in the rate of payments during the last quarter of 1981/82, compared to the previous 3 years, this would indicate the salutary impact of the new regime.

TABLE IV

REPAYMENTS (CASH) **IN LAST QUARTER** *VIS-A-VIS* **ANNUAL REPAYMENTS AND ANNUAL DUES : BSB** (PRIVATE SECTOR : ALL PROJECTS)

(In Tk. Million)

Year	Repayments in Last Quarter	Total Repayment during the Year	Total dues during the Year	'a' as % of 'b'	'a' as % of 'c'
1978/79	24.4	50.8	97.20	48.0	25.1
1979/80	24.9	56.4	165.9	43.7	14.9
1980/81	44.0	102.4	250.9	43.0	17.5
1981/82	72.6	164.3	446.4	44.2	16.3

Source : Figures on repayment in the last quarter of 1981/82 were obtained from the Loan Accounts Department, BSB. All other figures were obtained from the Research & Statistics Department, BSB.

The results are instructive. They show that even though payments in the last quarter of 1981/82 increased by 65% over 1980/81, rising to Tk. 72.6 million, the rate of recovery in the last quarter remained broadly unchanged compared to the last quarter of the previous two years. The rate for 1981/82 was 44% of the total recovery during the year compared to 43% in 1980/81 and 44% for 1979/80. Indeed the recovery rate in the 1981/82 period was lower in that quarter than for 1978/79 when it was 48%.

The data in Table IV suggests that the repayment practices of private entrepreneurs are such that arrears are permitted to build up during the first three quarters of the financial year, culminating in a sharp escalation in payments during the last quarter when close to half the payments made during the year are repaid. To this extent the ostensible escalation in repayments during the last quarter of 1981/82 was no more than consistent with the past trend. The higher absolute value simply indicated that in each successive year there is a build up in the total recoverable amount

of payments due to the financial institutions. This owes to the fact that each year the loan portfolio is growing and a rising volume of payments is falling due.

To take cognisance of the rise in dues every year we have attempted to relate total payments in the last quarter to total dues during the entire year for four successive years. Here again Table IV shows that the performance in 1981/82 shows no significant improvement. Payments made in the last quarter of 1981/82 came to 16.3% of what was due. This was somewhat below the performance in 1980/81 and in 1978/79 and only slightly better than that in 1979/80.

The persistence in the low rate of recovery against dues and outstandings, notwithstanding the pressures under the new regime to improve performance, suggests that the problem of repayment faced by private entrepreneurs is more intractable than appears at first glance. It may therefore require a rather deeper understanding of the structure of the default, the background of the defaulters, their operational performance and the policy environment in which they function. In this paper we will only focus on the structure of the default whereby we attempt to see the proportion of enterprises involved in the default and the types of enterprises more or less prone to default. This typology examines enterprises in relation to their location and by industrial sector. It also classifies them in relation to size and their operational status. The roots of the default as between different categories of enterprises is examined in subsequent components of the study.

The Sample for the Study

In order to review the main features of the defaulting enterprises we have taken a subsample of 408 enterprises from the total number of borrowers from both BSB and BSRS. This sample covers all new enterprises set up in the private sector under loan financing from BSB and BSRS. The sample covers 274 out of 840 borrowers from BSB which comes to 33% of total borrowers and 134 out of 470 borrowers from BSRS which comes to 28.5% of the their total borrowers. This sample whilst being fairly comprehensive excludes all borrowings prior to 1971 and all loans made to existing enterprises for purposes of balancing, modernisation and replacement of equipment (BMRE). Some sanctioned projects were also subsequently cancelled and many have not yet utilised their loans. By definition it excludes borrowings by public enterprise.[5]

[5]Annexure 3 of [1] serves to place our sample in the wider perspective of the lending operations of the Banks.

Differentials between Actual and Officially Recorded Repayments

Before we review this sub-sample, however, it would be useful to more closely focus on the actual as opposed to the published record of repayment since it is important to gauge the true record of the repayment performance. We have noted that the Bank's accounting practices tend to obscure the extent of the default. Once we can identify the actual extent of overdues we can proceed to analyse the repayment record by categories of enterprises. For purposes of identifying the discrepancies between book defaults and actual defaults for private enterprise we have been able to draw upon data for three years, 1978/81, for BSB and five years, 1976/81, for BSRS, for which comparable data are available.

Table V indicates that for these private enterprises, over the three years 1978/79 to 1980/81, total dues rose from Tk. 41 million to Tk. 323 million, a rise of 688%. The build up in the debt overhang can be seen by the data in Table V. The official records show that the proportion of recovered payments fell from 51.7% in 1978/79 to 37% in 1980/81. If however, we relate this to the total recoverable amount, which includes the overdues carried over from the previous year, then recovery falls from 33.8% in 1978/79 to 25.9% in 1980/81.

Table V brings out that even this poor and deteriorating repayment record is an overstatement. Thus in 1980/81, out of the official recorded repayments of Tk. 119.4 million, as much as Tk. 42 million or 35%, was made up of rephasements and adjustments in the books of the financial institutions.[6] This indicates that actual cash payments to the financial institutions made by the enterprises came to Tk 77.4 million. On this basis cash repayments came to 16.8% of the total recoverable amount in 1980/81 compared to the 37% shown in the official records as repayments.

If we compare the repayments performance for borrowers from BSB and BSRS the contrast is visible. In the case of BSB, Table Va shows that cash repayments in 1980/81 stood at 28.8% of the total recoverable amount. This marks some deterioration since 1978/79 when the rate was 34.7%. In contrast, Table Vb shows that BSRS has faced a sharp deterioration in performance. The cash repayment rate fell from 27.9% in 1976/77 to 2.7% in 1978/79 and recovered only slightly to 6% in 1980/81.

In both cases however, significant book adjustments were undertaken. Thus in the case of BSB, in the books cash repayment rates rose from 28.8% to 46.4%

[6]The mechanics of this process is discussed in Annexure 4 in [1]. This indicates that actual cash payment to the financial institutions made by the enterprises came to 16·8 of the total recoverable amount in 1980/81 compared to the 37% shown in the official records as repayments.

TABLE V

REPAYMENT PERFORMANCE OF NEW PROJECTS IN THE PRIVATE SECTOR (BSB+BSRS)

(In '000 Tk.)

	1978/79	1979/80	1980/81
1. Total Dues	41,373	1,45,330	3,22,773
2. Overdues of Previous Year	21,850	41,839	1,37,965
3. Total Recoverable Amount	63,223	1,87,169	4,60,738
4. Cash Repayment	16,378	34,978	77,409
5. Rephasement, Adjustments, etc.	5,006	14,226	41,951
6. Total Repayment	21,384	49,204	1,19,360
7. Overdues at Year End	41,839	1,37,965	3,41,378
8. Cash Repayment as % of Total Due	39.6	24.1	24.0
9. Cash Repayment as % of Total Recoverable Amount	25.9	18.7	16.8
10. Total Repayment as % of Total Due	51.7	33.9	37.0
11. Total Repayment as % of Total Recoverable Amount	33.8	26.3	25.9

Source : Computed from data obtained from the loan accounts Department BSB & Accounts Department BSRS. For detailed explanation of sources, methodology & definition of concepts used in this table see Annexure 4 in [1].

TABLE Va

REPAYMENT PERFORMANCE OF NEW PROJECTS IN THE PRIVATE SECTOR (BSB)

(in '000 Tk.)

	1978/79	1979/80	1980/81
1. Total Dues	30,087	77,198	1,57,953
2. Overdues of Previous Year	16,871	27,386	60,614
3. Total Recoverable Amount	45,958	1,04,584	2,18,567
4. Cash Repayment	15,943	31,479	63,009
5. Rephasements, Adjustments etc.	3,629	12,491	37,789
6. Total Repayment	19,572	43,970	1,00,798
7. Overdues at Year End	27,386	60,614	1,17,769
8. Cash Repayment as% of Total Due	53.0	40.8	39.9
9. Cash Repayment as % of Total Recoverable Amount	34.7	30.1	28.8
10. Total Repayment as % of Total Due	65.1	57.0	63.8
11. Total Repayment as % of Total Recoverable Amount	42.6	42.0	46.4

Source : As in Table V.

TABLE Vb

REPAYMENT PERFORMANCE OF NEW PROJECTS IN THE PRIVATE SECTOR (BSRS)

(in '000 Tk.)

	1976/77	1977/78	1978/79	1979/80	1980/81
1. Total Dues	742	5,242	11,286	68,132	1,64,820
2. Overdues of Previous Year	—	535	4,979	14,453	77,351
3. Total Recoverable Amount	742	5,777	16,265	82,585	2,42,171
4. Cash Repayment	207	798	435	3,499	14,400
5. Transfers, Rephasements, Adjustments	—	—	1,377	1,735	4,162
6. Total Repayment	207	798	1,812	5,234	18,562
7. Overdues at Year End	535	4,979	14,453	77,351	2,23,609
8. Cash Repayment as % of Total Due	27.9	15.2	3.8	5.1	8.7
9. Cash Repayment as % of Total Recoverable Amount	27.9	13.8	2.7	4.2	5.9
10. Total Repayment as % of Total Due	27.9	15.2	16.1	7.7	11.3
11. Total Repayment as % of Total Recoverable Amount	27.9	13.8	11.1	6.3	7.7

Source : As in Table V.

for total repayments. For BSRS it rose from 6% to 7.7%. In the case of BSB, readjustments seem to have taken place in all three years. In the case of BSRS however, this seems a phenomenon of the last three years. In 1978/79 the readjustment seems to have been particularly drastic with the cash payment rate falling as low as at 2.7%, compared to 11.1% for the recorded payments.

The Depth of the Default

It has been observed in the reviews of the extent of the default as discussed in Table V, that the rate of default in terms of its size is high and rising. This phenomenon could however conceal the fact that the deficit is concentrated in a few enterprises who contribute a large proportion of the default whilst the numerically larger number of enterprises are regularly servicing their bank debts. Table VI, shows that out of 408 enterprises borrowing funds from BSB and BSRS only 24 or 5.9%, have as of end 1980/81, fully met their debt obligations. In contrast 112 or 27.5% of the enterprises, have not paid a single paisa to service their debt. Indeed 42.5% of enterprises have repaid less than 10%, and 78.6% of enterprises have repaid less than 50% of what is due from them. These figures suggest that default in the servicing of debts to the Banks is all-pervasive throughout the private sector.

It is however of some interest to note from Tables VIa and VIb, that borrowers under BSB appear to have a significantly better repayment record than borrowers from BSRS. Thus 30.3% of BSB borrowers have paid more than 50% of their dues compared to 3% of BSRS. At the other end, 28% of BSB borrowers have paid less than 10% compared to 71.6% for BSRS.

Repayment Performance in Relation to Location

It is to be noted that the pattern of default is fairly widespread amongst enterprises throughout Bangladesh. Table VI shows that the proportion of enterprises who have made no repayments at all is uniformly high ranging from 23% amongst enterprises in Chittagong Division to 37% of those in Khulna Metropolitan area.

It could be hypothesised that enterprises located in more developed areas would have a better record than those located in backward areas. The conventional classification of areas according to their levels of development, puts the metropolitan centres of Dhaka, Chittagong and Khulna at the top of the list followed by the non-metropolitan areas of Dhaka and Chittagong Division. At the bottom of the list comes non-metropolitan Khulna Division and Rajshahi division. Within this classification, 223 or 55% of all borrowing enterprises are located in the metropolitan

TABLE VI

GEOGRAPHIC LOCATION AND DEGREE OF REPAYMENT : (BSB + BSRS)

Geographic Location	Degree of Repayment (in %)[a] 0	0.1—10	10—25	25—50	50—99	100	(No. of projects) Total	%[b]
Dhaka Division	12(30.0)	8(20.0)	3(7.5)	9(22.5)	7(17.5)	1(2.5)	40(100.0)	(9.8)
Rajshahi Division	17(32.7)	6(11.5)	8(15.4)	7(13.5)	8(15.4)	6(11.5)	52(100.0)	(12.7)
Khulna Division	9(31.0)	7(24.1)	6(20.7)	2(6.9)	3(10.3)	2(6.90)	29(100.0)	(7.1)
Chittagong Division	15(23.4)	8(12.5)	12(18.7)	16(25.0)	10(15.6)	3(4.7)	64(100.0)	(15.7)
Dhaka Metropolitan Area	44(25.6)	25(14.5)	26(15.1)	38(22.1)	28(16.3)	11(6.4)	172(100.0)	(42.1)
Chittagong Metropolitan Area	8(25.0)	6(18.8)	4(12.5)	8(25.0)	13(40.6)	1(3.1)	32(100.0)	(7.8)
Khulna Metropolitan Area	7(36.8)	1(5.3)	3(15.8)	6(31.6)	2(10.5)	—	19(100.0)	(4.6)
Total	**112(27.5)**	**61(14.9)**	**62(15.2)**	**86(21.1)**	**63(15.4)**	**24(5.9)**	**408(100.0)**	**(100.0)**

Note : [a]For the definition of the concept of degree of repayment see Annexure 4 in [1].

[b]Figures in this column are column percentages whereas all other figures inside parentheses are row percentages. Figures outside parentheses refer to number of projects.

Source : See Annexure 4 in [1].

TABLE VIa

GEOGRAPHIC LOCATION AND DEGREE OF REPAYMENT : (BSB)

Degree of Repayment (%) (No. of projects)

Geographic Location	0	0.1—10	10—25	25—50	50—99	100	Total	%[a]
Dhaka Division	8(25.8)	6(19.4)	2(6.5)	7(22.6)	7(22.6)	1(3.2)	31(100.0)	(11.3)
Rajshahi Division	8(23.5)	3(8.8)	3(8.8)	7(20.6)	7(20.6)	6(17.7)	34(100.0)	(12.4)
Khulna Division	9(34.6)	4(15.4)	6(23.1)	2(7.7)	3(11.5)	2(7.7)	26(100.0)	(9.5)
Chittagong Division	6(13.0)	4(8.7)	10(21.7)	13(28.3)	10(21.7)	3(6.5)	46(100.0)	(16.8)
Dhaka Metropolitan Area	15(14.4)	7(6.7)	14(13.5)	32(30.8)	26(25.0)	10(9.6)	104(100.0)	(37.9)
Chittagong Metropolitan Area	4(20.0)	—	2(10.0)	8(40.0)	5(25.0)	1(5.0)	20(100.0)	(7.3)
Khulna Metropolitan Area	3(23.1)	—	3(23.1)	5(38.5)	2(15.4)	—	13(100.0)	(4.7)
Total	**53(19.3)**	**24(8.3)**	**40(14.6)**	**74(27.1)**	**60(21.9)**	**23(8.4)**	**274(100.0)**	**(100.0)**

Note : [a]Figures in this column are column percentages whereas all other figures inside parentheses are row percentages. Figures outside parentheses refer to number of projects.

Source : See Annexure 4 in [1].

TABLE VIb

GEOGRAPHIC LOCATION AND DEGREE OF REPAYMENT : (BSRS)

	Degree of Repayment (%)						(No. of Projects)	
Geographic Location	0	0.1—10	10—25	25—50	50—99	100	Total	(%)[a]
Dhaka Division	4(44.4)	2(22.2)	1(11.1)	2(22.2)	—	—	9(100.0)	(6.7)
Rajshahi Division	9(50.0)	3(16.7)	5(27.8)	—	1(5.7)	—	18(100.0)	(13.4)
Khulna Division	—	3(100.0)	—	—	—	—	3(100.0)	(2.2)
Chittagong Division	9(50.0)	4(22.2)	2(11.1)	3(16.7)	—	—	18(100.0)	(13.4)
Dhaka Metropolitan Area	29(42.7)	18(26.5)	12(17.7)	6(8.8)	2(2.9)	1(1.5)	68(100.0)	(50.7)
Chittagong Metropolitan Area	4(33.3)	6(50.0)	2(16.7)	—	—	—	12(100.0)	(8.9)
Khulna Metropolitan Area	4(66.7)	1(16.7)	—	1(16.7)	—	—	6(100.0)	(4.5)
Total	**59(44.0)**	**37(27.6)**	**22(16.4)**	**12(9.0)**	**3(2.2)**	**1(0.8)**	**134(100.0)**	**(100.0)**

Note : [a]Figures in this column are column percentages whereas all other figures inside parentheses are row percentages. Figures outside parentheses refer to number of projects.

Source : See Annexure 4 in [1].

centres. Of these, 172 or 42% of the total are located in the Dhaka Municipal area. In contrast Khulna and Rajshahi Divisions account for 20% of all enterprises.

The repayment performance however, does not validate the idea that metropolitian centres perform significantly better. If we take the Dhaka metropolis as the apex of development, 26% of enterprises have paid nothing, compared to the nationl average of 27%. At the other end of the scale only 6.4% of enterprises have fully repaid their loans compared to the national average of 5.9%. Indeed the Dhaka metropolitan area average tends to fairly closely approximate the national average at all levels of repayment. However, by contrast, non-metropolitan Dhaka has a repayment record well below the national average with 50% of borrowers paying less than 10% of their dues.

If we look at Rajshahi division at the opposite end of the specturm of development, the proportion of firms with a 100% repayment record stands at 11.5% which is twice the national average. If we take payments upto 10% of dues, here again Rajshahi performs marginally better. Similarly if we take repayments at 50%-plus, again Rajshahi is above average and even performs better than the Dhaka metropolis. Khulna Division appears perhaps to be the poorest performer. The record of both the metropolitan and non-metropolitan areas of Khulna tends to come out as below the national average.

Chittagong metropolis appears to have marginally the best record with 43.7% of its enterprises having a repayment record above 50% ; though at the opposite end, 43.7% have repaid only upto 10% of their dues. Non-metropolitan Chittagong Division has only 20% of enterprises with repayments above 50% but 36% with payments below 10% which is slightly better than the average.

The available results do not appear to suggest that a significant relationship exists as between geographic location and repayment performance. It would thus appear that the pervasiveness of default tends to transcend territorial deliniations as between more and less developed regions in Bangladesh.

Repayment Performance in Relation to Sectors

The most plausible area to look for variations would appear to be within the differentiated performance amongst industrial sectors. Within a market regime it would be expected that scope for profitable operations would vary widely between different industrial sectors. Market conditions change over time so that over any length of time the circumstances of different sectors would undergo changes in

their relative positions. The differentiated performance would in turn be expected to affect the relative repayment capacity of enterprises in different industrial sectors. For such a definitive conclusion we would need to relate sectoral profitability to the sectoral repayment performance. However, in the absence of any review of the operational performance of enterprises we use repayment as a proxy measure.

Table VII distributes borrowers as between 14 sectors. These include services and transport plus 12 manufacturing sectors. The distribution of borrowers is quite concentrated. Five sectors—Food, Transport, Services, Textiles and Jute—account for 345 enterprises or 84.6% of all enterprises. Food and Transport account for exactly 50% of borrowing enterprises. The Food sector largely covers borrowing for grain mills and cold storage. The borrowing for transport is concentrated in inland water transport capacity though a few enterprises have borrowed for the road transport sector. Services which account for 73 or 18% of enterprises largely cover investments in cinema houses and hotels.

It is significant that at the bottom of the scale covering repayments below 10%, the two biggest borrowers, Food and Transport, perform below the national average. At the upper end covering payments above 50%, their performance is closer to the national average through still below par. The Transport sector in particular has one of the poorest records. 36% of borrowers have paid nothing to date, 46% have paid below 10% and only 17% have paid above 50% of their dues. The Jute sector appears to be in similarly poor shape. A third of all borrowers have paid nothing, 42% have paid less than 10% and only 21% have paid above 50% of their dues.

Amongst the big borrowers, Textiles appears to have performed relatively better. This sector largely covers garment manufactures, plus specialised products. Here only 13.6% have not paid anything but 36% have paid less than 10%. This is still below the national average. In contrast they have no units which have fully paid up their dues though 23% have paid more than 50%. This is slightly above par.

Moving down the scale, Paper does relatively well. 23% of its borrowers have a 100% repayment record and 38% have paid less than 10% of their dues. In contrast, in Chemicals, 47% of enterprises have paid less than 10%. Not a single enterprise has a 100% payment record though 21% have paid above 50% of dues. Metals appear to have an equally poor record with 70% having paid less than 10% and only 10% above 50%. Below this the number of borrowers tapers off. Of six borrowers in the Electrical sector only one has paid more than 50% of its dues. In contrast, of four borrowers in the Forest products sector, three have paid more than 50%.

TABLE VII

SECTOR-WISE DEGREE OF REPAYMENT : (BSB+BSRS)

Degree of Repayment (%) (No. of Projects)

Sector	0	0.1—10	10—25	25—50	50—99	100	Total	(%)[a]
1. Food	33(29.5)	17(15.2)	17(15.2)	23(20.5)	17(15.2)	5(4.5)	112(100.0)	(27.4)
2. Transport	33(35.9)	9(9.8)	10(10.9)	24(26.1)	12(13.0)	4(4.4)	92(100.0)	(22.5)
3. Service	20(27.4)	9(12.3)	13(17.8)	13(17.8)	9(12.3)	9(12.3)	73(100.0)	(17.9)
4. Textile	6(13.6)	10(22.7)	8(18.2)	10(22.7)	10(22.7)	—	44(100.0)	(10.8)
5. Jute	8(33.3)	2(8.3)	2(8.3)	7(29.2)	4(16.7)	1(4.2)	24(100.0)	(5.9)
6. Paper	3(23.1)	2(15.4)	3(23.1)	1(7.7)	1(7.7)	3(23.1)	13(100.0)	(3.2)
7. Chemicals	3(15.8)	6(31.6)	3(15.8)	3(15.8)	4(21.0)	—	19(100.0)	(4.6)
8. Metal	5(50.0)	2(20.0)	1(10.0)	1(10.0)	1(10.0)	—	10(100.0)	(2.4)
9. Electrical	—	2(33.3)	2(33.3)	1(16.7)	—	1(16.7)	6(100.0)	(1.5)
10. Forest	—	1(25.0)	—	—	2(50.0)	1(25.0)	4(100.0)	(1.0)
11. Non-Metal	1(25.0)	—	1(25.0)	1(25.0)	1(25.0)	—	4(100.0)	(1.0)
12. Leather	—	1(25.0)	1(25.0)	1(25.0)	1(25.0)	—	4(100.0)	(1.0)
13. Petro-Chemicals	—	—	1(50.0)	1(50.0)	—	—	2(100.0)	(0.5)
14. Rubber	—	—	—	—	1(100.0)	—	1(100.0)	(0.3)
Total	**112(27.5)**	**61(14.9)**	**62(15.2)**	**86(21.1)**	**63(15.4)**	**24(5.9)**	**408(00.0)**	**(100.0)**

Note : [a] Figures in this column are column percentages whereas all other figures inside parentheses are row percentages. Figures outisde parentheses refer to number of projects.

Source : See Annexure 4 in [1].

TABLE VIIa

SECTOR-WISE DEGREE OF REPAYMENT : (BSB)

Degree of Repayment (%) (No. of Projects)

Sector	0	0.1—10	10—25	15—50	50—99	100	Total	%[a]
1. Food	12(18.5)	3(4.6)	10(15.4)	19(29.2)	16(24.6)	5(7.7)	65(100.0)	(23.7)
2. Transport	11(19.0)	2(3.5)	5(8.6)	24(41.4)	12(20.7)	4(6.9)	58(100.0)	(21.2)
3. Service	15(24.6)	9(14.8)	9(14.8)	11(18.0)	8(13.1)	9(14.8)	61(100.0)	(22.3)
4. Textile	5(14.3)	4(11.4)	6(17.1)	10(28.6)	10(28.5)	—	35(100.0)	(12.8)
5. Jute	3(27.3)	—	—	4(36.4)	4(36.4)	—	11(100.0)	(4.0)
6. Paper	2(20.0)	—	3(30.0)	1(10.0)	1(10.0)	3(30.0)	10(100.0)	(3.6)
7. Chemicals	1(10.0)	2(20.0)	3(30.0)	1(10.0)	3(30.0)	—	10(100.0)	(3.6)
8. Metal	3(42.9)	1(14.3)	1(14.3)	1(14.3)	1(14.3)	—	7(100.0)	(2.5)
9. Electrical	—	2(40.3)	1(20.0)	1(20.0)	—	1(20.0)	5(100.0)	(1.8)
10. Forest	—	1(25.0)	—	—	2(50.0)	1(25.0)	4(100.0)	(1.4)
11. Non-Metal	1(33.3)	—	1(33.3)	—	1(33.3)	—	3(100.0)	(1.1)
12. Leather	—	—	—	1(50.0)	1(50.0)	—	2(100.0)	(0.7)
13. Petro-Chemicals	—	—	1(50.0)	1(50.0)	—	—	2(100.0)	(0.7)
14. Rubber	—	—	—	—	1(50.0)	—	1(100.0)	(0.4)
Total	**53(19.3)**	**24(8.8)**	**40(1.46)**	**74(27.0)**	**60(21.9)**	**23(8.4)**	**274(100.0)**	**(100.0)**

Note : [a] Figures in this column are column percentages whereas all other figures inside parentheses are row percentages. Figures outside parentheses refer to number of projects.

Source : See Annexure 4 in [1].

TABLE VIIb

SECTOR-WISE DEGREE OF REPAYMENT : (BSRS)

Sector	Degree of Repayment (%) 0	0.1—10	10—25	25—50	50—99	100	Total	(No. of Projects) %[a]
1. Food	21(44.7)	14(29.8)	7(14.9)	4(8.5)	1(2.1)	—	47(100.0)	(35.1)
2. Transport	22(64.7)	7(20.6)	5(14.7)	—	—	—	34(100.0)	(25.4)
3. Service	5(41.7)	—	4(33.3)	2(16.7)	1(8.3)	—	12(100.0)	(8.9)
4. Textile	1(11.1)	6(66.7)	2(22.2)	—	—	—	9(100.0)	(6.7)
5. Jute	5(38.5)	2(15.4)	2(15.4)	3(23.0)	—	1(7.7)	13(100.0)	(9.7)
6. Paper	1(33.3)	2(66.7)	—	—	—	—	3(100.0)	(2.2)
7. Chemicals	2(22.2)	4(44.4)	—	2(22.2)	1(11.1)	—	9(100.0)	(6.7)
8. Metal	2(66.7)	1(33.3)	—	—	—	—	3(100.0)	(2.2)
9. Electrical	—	—	1(100.0)	—	—	—	1(100.0)	(0.7)
10. Forest	—	—	—	—	—	—	—	—
11. Non-Metal	—	—	—	1(100.0)	—	—	1(100.0)	(0.7)
12. Leather	—	1(50.0)	1(50.0)	—	—	—	2(100.0)	(1.5)
13. Petro-Chemicals	—	—	—	—	—	—	—	—
14. Rubber	—	—	—	—	—	—	—	—
Total	59(44.0)	37(27.6)	22(16.4)	12(8.9)	3(2.2)	1(0.8)	134((100.0)	(100.0)

Note : [a] Figures in this column are column percentages whereas all other figures inside parentheses are row percentages. Figures outside parentheses refer to number of projects.

Source : See Annexure 4 in [1].

Of others the one borrower in the Rubber sector has paid more than 50%, whilst in the area of Petro-chemicals, neither of two borrowers have paid more than 50%.

Reviewing all sectors and excluding those with insufficient borrowers to provide a sufficient indicator of performance, it would be hard to discern any conspicuous pattern of performance. No sector stands out as having a particularly noticeable record of good or bad payments, except perhaps Metals. Whilst Transport performs somewhat less well than Textiles their performance does not diverge to an extent that it warrants the enunciation of a behaviourial hypothesis. It would appear that the pervasiveness of the poor repayment performance which was noticeable amongst regions applies also to sectors. No doubt as and when one analyses different enterprises in more detail, the unique problems of particular sectors can be more fully elaborated and some more conclusive evidence can be built up about which sectors are more bankable than others. However, within the available evidence it would appear that the problem of insufficient repayment of dues to the financial institutions is endemic to the entire class of private entrepreneurs and cuts across region and sector.

Repayment Performance in Relation to the Size of the Enterprise

It is normally assumed that some relation exists between the scale of operations of an enterprise and the degree of repayment. This view originates in the notion that larger enterprises have both superior cash flow and more adequate financial reserves to service their debts. In actual practice, however, debt service capability obviously relates to the operational performance of an enterprise which need not bear any relationship to its size. To this extent the question under review relates to whether bigger enterprises perform more efficiently than smaller ones. Within this paper we have used loan size as a proxy for the scale of operations. This was necessary in so far as data was not at hand to classify enterprises by the volume of investment or size of output. We have already noted that in the Bangladesh context loan size can be treated as a workable proxy for scale of operations.

We now examine the available empirical evidence to examine whether the size of the loan has any bearing on the actual repayment performance of our surveyed projects. Table VIII summarises the relevant information. The projects are divided into seven groups depending on the size of their loans. At the bottom of the scale we classify projects having a loan size below Tk. 1 million. At the highest echelon we classify borrowers whose loans exceed Tk. 50 million. It may be observed that more than half of the projects fall within the lower end of the scale. Thus 208 of the 408 projects surveyed, i.e., 51%, have a loan size below Tk. 2.50

TABLE VIII

LOAN SIZE AND DEGREE OF REPAYMENT : BSB+BSRS)

Degree of Repayment (%) (No. of Projects)

Loan Size (in million Tk.)	0	0.1—10	10—25	25—50	50—99	100	Total	%[a]
0.01—1.00	11(11.8)	9(9.7)	12(12.9)	27(29.0)	24(25.8)	10(10.7)	93(100.0)	(22.8)
1.00—2.50	28(24.4)	17(14.8)	22(19.1)	20(17.4)	21(18.3)	7(6.0)	115(100.0)	(28.2)
2.50—5.00	36(40.5)	17(19.1)	15(16.8)	13(14.6)	7(7.9)	1(1.1)	89(100.0)	(21.8)
5.00—10.00	25(37.3)	11(16.4)	10(14.9)	13(19.4)	4(6.0)	4(6.0)	67(100.0)	(16.4)
10.00—20.00	7(22.6)	6(19.4)	1(3.3)	10(32.3)	6(19.3)	1(3.3)	31(100.0)	(7.6)
20.00—50.00	1(20.0)	—	2(40.0)	1(20.0)	—	1(20.0)	5(100.0)	(1.2)
50+	4(50.0)	1(12.5)	—	2(25.0)	1(12.5)	—	8(100.0)	(1.9)
Total	112(27.5)	61(15.0)	62(15.2)	86(21.1)	63(15.9)	24(5.9)	408(100.0)	(100.0)

Note : [a]Figures in this column are column percentages whereas all other figures inside pearentheses are row percentages. Figures outside parentheses refer to number of projects.

Source : See Annexure 4 in [1].

million. Another 38%, covering 156 projects, were sanctioned loans between Tk. 2.5 million and Tk. 10.00 million. Only 14% of the surveyed projects had loans exceeding Tk. 10 million.

These figures are aggregated and thus conceal differences as between BSB and BSRS projects. Significant differences are observed when projects are differentiated as between projects financed by BSB and BSRS. Unlike BSB, BSRS has a built-in policy bias towards financing large projects and this is reflected in the profiles of the projects of these two institutions. Whereas 66% of the BSB financed porjects had a loan size below Tk. 2.5 million, only 20% of the BSRS projects fell in this category. Similarly whereas only 18% of BSB projects had loans larger than Tk. 5.00 million, in BSRS, 46% of the projects had such large loans.

With this profile in mind, we now examine the repayment performance *vis-a-vis* loan size first for the aggregate data and then for the two institutions separately. As before, we use three different criteria to identify relationships. Firstly, we examine the relative incidence of absolute defaults between different loan size groups. Secondly, the relative incidence of good payments (as defined below) between groups and thirdly the distribution of the exceptional projects i.e., those which paid 100% of their dues, among the different groups is studied. A multiple criteria is necessary because a single criterion may lead to misleading results. Thus a particular group of borrowers may show very little incidence of absolute default, but this by itself should not be taken to be adequate evidence for concluding that this group has performed better relative to other groups. This is because it is quite possible that the bulk of the remaining projects (who had not defaulted absolutely) may have actually performed only slightly better i.e., paying between say 1% - 10%, with only a few managing to put up a better show. On the other hand, another group of borrowers may have a relatively greater proportion which had defaulted absolutely but where a substantial proportion may have had a good payment record. It would be incorrect under these circumstances to pass the judgement that the former group, by virtue of having a lower incidence of absolute defaults, had performed better. It is necessary, therefore, to view repayment performance from a number of angles in order to reach strong conclusions.

We first consider the case of absolute defaults. Here we observe an inverted 'U' shaped relation between loan size and the extent of absolute defaults. The incidence of absolute default is the lowest for the smallest borrowers, namely those having a loan size below Tk.1 million, with only 12% of these borrowers defaulting absolutely. This percentage then rises as we go to higher loan size groups and reaches a peak for the loan size group Tk. 2.5--5.00 million where 40% of the projects

defaulted absolutely. After this, one witnesses a reduced incidence of such defaults as one moves upwards towards the big borrowers. However, an exception is provided by the largest borrowers i.e., those having loans above Tk. 50 million, where exactly half of the borrowers paid nothing.

A look at the profile of the relatively better repayers leads one to similar conclusions. Whereas 36% of the smallest borrowers paid at least half of their dues, the next two classes performed poorly with only 24% and 9% respectively achieving this degree of repayment. The incidence of good repayment however increases as one moves to the class of large borrowers. Thus 12% and 23% of the borrowers having loan size between 5.00—10.00 million Taka and 10.00—20.00 million Taka respectively performed moderately well by succeeding in meeting at least half their dues. However, the very large borrowers i.e., those having loans exceeding Tk. 20 million again performed poorly.

A third criterion considers the projects which had paid 100% of their dues. Table VIII shows that out of the 24 projects which fell in this category, 10 (or 42%) belonged to the class of smallest borrowers i.e., those who had loans below Tk. 1.00 million, despite the fact that these borrowers represented only 20% of all borrowers. On the other hand out of the 44 projects which had loans exceeding Tk. 10 million, only two succeeded in paying all their dues.

The above analysis relates to the projects funded by both financial institutions. We now examine the BSB and BSRS funded projects separately. Table VIIIa indicates that the BSB projects display trends almost similar to the trends mentioned above. Consolidating the various classes of borrowers into three classes—the small loanees having loans below Tk. 2.5 million, the medium loanees having liabilities between Tk. 2.5 million and Tk. 10.00 million and the large borrowers having loans exceeding Tk. 10 million—we observe that whilst 16.6% of the small borrowers defaulted absolutely, the relevant percentages are 25% and 23% for the next two classes. Similarly the percentage of good repayers, i.e., who paid at least half their dues, are 34.5%, 21% and 41% respectively. However, 43% of the borrowers who paid 100% of their dues belonged to the 'smallest borrowers' class though this class constituted only 33% of all borrowers.

In BSRS the general repayment performance is relatively much poorer and we have only four projects out of 134 which succeeded in paying at least half their dues. Out of these, three had a loan size below Tk. 2.5 million. Though there were 61 projects having a loan size exceeding Tk. 5.00 million, none of them could meet even 10% of their dues. In fact 53 projects out of these 61 i.e., 87% could pay at

TABLE VIIIa

LOAN SIZE AND DEGREE OF REPAYMENT : (BSB)

Degree of Repayment (%) (No. of Projects)

Loan Size (in Tk. million)	0	0.1—10	10—25	25—50	50—99	100	Total	%[a]
0.01—1.00	11(11.9)	9(9.8)	12(13.0)	27(29.3)	23(25.0)	10(10.9)	92(100.0)	(33.6)
1.00—2.50	19(21.4)	10(11.2)	16(18.0)	18(20.2)	20(22.5)	6(6.7)	89(100.0)	(32.5)
2.50—5.00	13(30.2)	4(9.3)	8(18.6)	11(25.6)	6(13.9)	1(2.3)	43(100.0)	(15.7)
5.00—10.00	5(17.9)	1(3.6)	4(14.3)	10(35.7)	4(14.3)	4(14.3)	28(100.0)	(10.2)
10.00—20.00	4(25.0)	0(0.0)	0(0.0)	5(31.2)	6(37.5)	1(6.3)	16(100.0)	(5.8)
20.00—50.00	0(.0.0)	0(0.0)	0(0.0)	1(50.0)	0(0.0)	1(50.0)	2(100.0)	(0.7)
50.00+	1(25.0)	0(0.0)	0(0.0)	2(50.0)	1(25.0)	)0(0.0	4(100.0)	(1.4)
Total	53(19.3)	24(8.8)	40(14.6)	74(27.0)	60(21.9)	23(8.4)	274(100.0)	(100.0)

Note : [a]Figures in this column are column percentages whereas all other figures inside parentheses are row percentages. Figures outside parentheses refer to number of projects.

Source : See Annexure 4 in [1].

TABLE VIIIb

LOAN SIZE AND DEGREE OF REPAYMENT : (BSRS)

Loan Size (in million Tk.)	Degree of Repayment (%) 0	0.1—10	10—25	25—50	50—99	100	Total	(No. of Projects) %[a]
0.01—2.50	9(33.3)	7(25.9)	6(22.2)	2(7.4)	2(7.4)	1(3.7)	27(100.0)	(20.1)
2.50—5.00	23(50.0)	13(28.3)	7(15.2)	2(4.3)	1(2.2)	0(—)	46(100.0)	(34.3)
5.00—10.00	20(51.3)	10(25.6)	6(15.4)	3(7.7)	9(—)	0(—)	39(100.0)	(29.1)
10.00—20.00	3(20.0)	6(40.0)	1(6.7)	5(33.3)	0(—)	0(—)	15(100.0)	(11.2)
20.00—50.00	1(33.3)	0(—)	2(66.7)	0(—)	0(—)	0(—)	3(100.0)	(2.2)
50.00 +	3(75.0)	1(25.0)	0(—)	0(—)	0(—)	0(—)	4(100.0)	(2.9)
Total	59(44.0)	37(27.6)	22(16.4)	12(8.9)	3(2.2)	1(0.8)	134(100.0)	(100.0)

Note : [a]Figures in this column are column percentages whereas all other figures inside parentheses are row percentages. Figures outside parentheses refer to number of projects.

Source : See Annexure 4 in [1].

most 25% of their dues. For the very large projects the performance is even more disappointing. More than half the projects defaulted absolutely with the rest paying up less than a quarter of their dues Thus whilst the BSRS projects on the whole performed worse than BSB projects, there are some differences in performance amongst the BSRS projects themselves. Thus the small and large projects did relatively better than the medium and the very large ones.

The above analysis regarding the relationship between loan size and degree of repayment suggests that contrary to a priori expectations no positive relationship between these two variables seemed to exist at least for the projects surveyed by us. In fact if any strong conclusion can be deduced from the evidence presented above it is that the smallest borrowers tend to have the most satisfactory repayment performance relative to other borrowers. Not only is the incidence of absolute default less common but the proportion of borrowers making good payments is also larger for this group. Moreover a more than proportionate number of the very good repayers i.e., those who paid 100% of their dues, belonged to this group. By some criterion, the large borrowers also perform well but there is no uniform trend for them which could lead to any clear conclusion regarding the performance.

The fact that no definite trend could be discerned is not altogether surprising given the fact that, as mentioned before, repayment performance is influenced by a multitude of factors, the effect of which could at times be mutually exclusive. Once again the fact that default does not clearly demonstrate a tendency to be specific to particular size groups of projects points to its pervasiveness amongst the full range of private entrepreneurs.

Operational Status of the Enterprise

In concluding our review of the repayment record for various categories of borrowers it may be useful to look at performance as between those enterprises which have gone into operation and those which are still under implementation. As mentioned before figures for both cash payments as well as dues which are being used to measure the degree of repayment are cumulative figures giving total dues and payments from the inception of the loan to 30th June 1981, which is our cut-off date. Regarding the status of the project we have however taken 30th June 1980 as the cut-off date to cover projects which were already in operation by that date. Projects which went into operation during 1980/81 have not been treated as being in operation on the assumption that the full effect of a project going into operation on its repayment performance is manifested only after a time lag.

Thus for projects which have gone into operation in 1980/81 it is assumed that the effect of this development on repayment is likely to work itself out at the earliest in 1981/82.

Theoretically a significant improvement in repayment performance is expected to occur once a project goes into operation. Entrepreneurs commonly attribute their defaults on repayment to the fact that their project is still under implementation and consequently cash generation and by implication capacity to service debt, is low. Hence when a project is in operation and is generating revenue, the ability to repay loans will increase and this will be reflected in a quantum improvement in the degree of repayment. The hypothesis, therefore, argues that projects in operation will exhibit, on the average, a greater degree of repayment in relation to those which are yet to go into operation.

Table IX illustrates the relative performance of these two categories of projects. We have estimates for the two institutions separetely as well as for the aggregate. All the three sets of information suggest that operational projects tend to perform better than the non-operational ones as far as loan repayment is concerned. The first observation that can be made is the relatively smaller extent of absolute defaults amongst the class of operational projects. Whereas, in the aggregate, 37% of the under-construction projects defaulted absolutely i.e., paid nothing at all, only 8.7% of the operational ones fell into this category. Another 22% of the latter paid between 0.1%—10% of their dues, whereas only 11% of the former fell in this category. Thus whilst 31% of the operational projects performed poorly by paying less than 10% of their dues, almost half of the non-operational projects (i.e., 48%) had a similar performance. The relatively better performance of the completed projects is again indicated when we study the case of the better repayers. Whereas only 20% of the under-construction project paid more than 50% of their dues, almost 25% of the operational projects fell in this category. It thus appears that there is some difference in the repayment performance of the operational projects *vis-a-vis* that of the non-operational ones.

The above was a summary of the findings for all projects taken together. Significant differences however exist between the projects of the two institutions and it would be useful to examine the information of the two institutions separately. Table IX shows that in BSB, absolute defaults among the operational projects is quite rare, with only 2.4% performing poorly compared to 26% of the non-operational projects. At the upper end of the specturm it is again observed that whilst almost 39% of the former paid at least half of their dues the corresponding percentage for the latter is only 27%.

TABLE IX

STATUS OF PROJECT AND DEGREE OF REPAYMENT

	Degree of Repayment (%)						No. of Projects)	
	0	0.1—10	10—25	25—50	50—99	100	Total	%[a]
BSB+BSRS								
Operational	12(8.7)	31(22.5)	28(20.3)	33(23.9)	24(17.4)	10(7.3)	138(100.0)	(33.8)
Non-operational	100(37.0)	30(11.1)	34(12.6)	53(19.6)	39(14.4)	14(5.2)	270(100.0)	(66.2)
Total	**112(27.4)**	**61(14.9)**	**62(15.2)**	**86(21.1)**	**63(15.4)**	**14(5.9)**	**408(100.0)**	**(100)**
BSB								
Operational	2(2.4)	8(9.8)	13(15.9)	27(32.9)	23(28.0)	[illegible](11.0)	82(100.0)	(29.9)
Non-operational	51(26.6)	16(8.3)	27(14.0)	47(24.5)	37(19.3)	14(7.3)	192(100.0)	70.1)
Total	**53(19.3)**	**24(8.8)**	**40(14.6)**	**74(27.0)**	**60(21.9)**	**23(8.4)**	**274(100.0)**	**(100)**
BSRS								
Operational	10(17.9)	23(41.0)	15(26.8)	6(10.7)	1(1.8)	1(1.8)	56(100.0)	(41.8)
Non-operational	49(62.8)	14(17.9)	7(9.0)	6(7.7)	2(2.6)	0(0.0)	78(100.0)	(58.2)
Total	**59(44.0)**	**37(27.6)**	**22(16.4)**	**12(8.9)**	**3(2.2)**	**1(0.7)**	**134(100.0)**	**(100)**

Note : [a]Figures in this column are column percentages whereas all other figures inside parentheses are row percentages. Figure outside parentheses refer to number of projects.

Source : See Annexure 4 in [1].

Table IX shows a similar trend in the case of BSRS projects. Here, as observed before, the average repayment performance is worse than in case of BSB, with 44% of the borrowers paying nothing at all. However, the extent of absolute default becomes even larger when we consider only the projects under implementation. Almost two-thirds (i.e., 62.82%) of BSRS non-operational projects defaulted absolutely in meeting their dues. In sharp contrast, only around 18% of the operational projects fell in this cateory. However, whilst the extent of absolute default is relatively lower in case of these projects, the balance of the operational projects do not seem to be performing very satisfactorily. The bulk of them i.e., around 78%, actually fall in the category of poor payers paying out between 0.1 to 5.0% of their dues. Thus only around 3.5% of these projects succeeded in paying more than half their dues. In this respect, non-operational projects are not far behind with around 2.5% paying more than a half of their dues. The superior performance of BSRS operational projects thus seems to be limited to only a lesser degree of absolute default rather than a higher degree of good payments.

Whilst the BSRS operational projects may have performed slightly better than the non-operational ones, their performance is quite dismal compared to the BSB projects. In case of the latter, as we observed before, 38% of the operational projects and 27% of the non-operational ones had paid between 50%—100% of their dues whereas in BSRS only 3.66% of the operational projects succeeded in performing as well. The latter projects have thus performed worse not only compared to the operational projects in BSB but also *vis-a-vis* the non-operational projects of that institution.

The above analysis suggests that, with some qualifications, the hypothesis that projects in operation will tend to perform better as far as loan repayment in concerned, compared to projects still under implementation, is vindicated by our empirical findings. It must be emphasised, however, that the relatively better performance of the operational projects should not obscure the fact that in absolute terms the loan repayment performance of these projects is still singularly modest. The fact that more than half of the operational projects paid less than a quarter of their dues and that only a quarter managed to pay more than 50% of dues is by no standards an impressive performance.

This review of the operational status of enterprises thus suggests that policymakers in Bangladesh have two further problems to consider in seeking to improve the repayment performance of borrowers from the financial institutions. The first relates to the long gestation lag as between the sanction of the loan and the commissioning of a project. The incapacity to generate revenues inevitably leads to a build

up of arrears since borrowers appear to have limited cash resources outside of the project to service dues incurred during the implementation stage. This would imply that borrowers tend to be financially in poorer shape than they project themselves when applying for loans. Alternatively, they are disinclined to tie up their own resources in debt servicing, leaving the public financial institutions to bear the bulk of the financial burden. Depending on which particular assumption is found to be valid, the repayment schedules will need to be revised or a more rigorous investigation into the financial circumstances of the entrepreneurs would appear to be in order.

The second problem relates to the fact that projects even when made operational still fail to maintain a satisfactory debt service record. This aspect of the problem is of course implicit in our earlier review of payment performance for various categories of projects. These reviews however, conceal the difference between operational and non-operational projects. If, therefore, it is noted that even operational projects perform inadequately, then the policymakers concerned with the need to improve repayment performance are faced with a more intractable problem relating to the character of the entrepreneurial class and the socio-economic environment within which they operate.

V. POLICY IMPLICATIONS

At the outset of this paper we have noted that a very sizeable sum of Tk. 9,859 million has been invested in a strategy to build up private entrepreneurship in Bangladesh. Such a policy has taken as its point of departure the presumed inefficiency of public enterprise and a corresponding axiomatic belief in the capacity of private enterprise to deliver the goods. Our paper does not provide conclusive evidence on the nature, performance and problems of private enterprise. It does however, provide evidence that this investment of Tk. 9,859 million of public funds in the service of private entrepreneurship has yielded very little in the way of repayments due within the terms of the loan agreements contracted with the financing institutions. Actual payments stand at 22.5% of what is recoverable as of end March 1982 under the terms of the loans contracted by private entrepreneurs. The borrowing entrepreneurs may or may not have valid reasons for their default. But the end product of this massive and pervasive default is that those finanaial institutions specifically commissioned to promote private entreprenurship have in the last decade made little progress in regenerating investible resources. They continue to depend on injuctions of foreign loans to keep their lending programmes operational. Upto end March 1982, Tk. 453.53 crores of external funds had been contracted to promote the development of entrepreneurship in Bangladesh.

If the government is to perpetuate this policy of channelling public funds to promote private enterprise and is to supplement these by disinvesting significant components of the nationalised sector to private entrepreneurs on terms of easy credit, then the least it can do is to take stock of how effectively private enterprise in Bangladesh has serviced its past debts to public financial institutions. If as is suggested from this paper, the repayment performance of private enterprise is infected by a generic malaise which constrains its performance as a class, then the prevailing policy of promoting private enterprise is likely to be both expensive and unrewarding. Policymakers in Bangladesh, constrained by the acute scarcity of domestic reasources and facing a consequential growth in external dependence would therefore need to review their policies and investment strategies towards the private sector. This could either lead to significant changes in the policy environment within which private enterprise must perform or could even involve a redirection of public policy and investment away from the private sector.

It is surprising and significant that upto June 1982, successive regimes have injected Tk. 9,859 million into the development of private entrepreneurship. These funds have gone to about 1257 projects in the private sector. Allowing for the fact that some family business houses control more than one project we may estimate that about 1000 families have benefited from the receipt of public funds. Given this large and concentrated placement of public funds it may have been expected that close and regular scrutiny would be exercised over the allocation of the funds and the efficacy of their utilisation. In practice not a single study or even intra-governmental review has been attempted in the last seven years over the disposal and impact of these funds. More significantly, the principal external financiers of these financial institutions, the World Bank and the Asian Development Bank, appear to have been somewhat casual towards the fate of their extensive loans to these institutions. This is in marked contrast to the regular and intensive reviews they undertake of various public sector institutions both in the way of specialised studies and in their annual reviews for the Bangladesh Aid Consortium. The rare in-house reviews of particular credits to the financial institutions undertaken by these two principal aid donors receive little publicity and scarcely a reference in the World Bank's annual review of the economy.

Given this rather massive information gap in relation to the use of public funds by private entrepreneurs it is hardly surprising that we should witness such a massive build up in unserviced debts incurred by the private sector which should now be attracting the concerns of the new regime who have set up various Martial Law enquiry teams to look into the question. It should, however, be made clear that these ad-hoc reviews of specific aspects of the lending programme to the private sector

provide an insufficient basis for reviewing public policy towards private entrepreneurship. For this a comprehensive review of the underlying socio-political assumptions of the policy, its evolution, operation and implications would appear to be an urgent necessity before further resources are diverted towards the development of private entrepreneurship in Bangladesh.

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Implications of Seasonality of Rural Labour Use Pattern : Evidences from Two Villages in Bangladesh*

by

RUSHIDAN ISLAM RAHMAN**

Labour use in agriculture is highly seasonal. The nature and implications of such seasonality are explored in this paper at a micro level using data from two villages in Bangladesh. It is found that rural unemployment due to seasonal factors is much greater than non-seasonal unemployment. As a result, poverty and food shortage is very much a seasonal phenomenon. The paper also analyses the implications of seasonality for the overall use of labour, forms of labour hiring and the role of non-agricultural activities.

I. INTRODUCTION

Seasonality of labour use is inherent in agriculture, as production in this sector depends crucially on climatological and biological factors. Many of the non-agricultural activities in the rural areas are also dependent on weather. As a result, employment pattern of rural labour force shows pronounced seasonal fluctuation.

Such seasonality of productive activity has important implications for the problem of unemployment and consequent poverty. The question of labour allocation may also be related to the seasonal pattern of labour demand. Consequently, the nature and implications of seasonality need to be fully analysed both for the purpose of adoption of proper policies to enhance the welfare of the masses, and to ensure proper allocation of resources, specially labour. In this paper our objective is to throw some light on the issues involved.

Firstly in Section II we present an analysis of the nature of seasonal labour use pattern in agriculture. Then we shall try to analyse the extent of underutilisation of labour force as a result of such seasonality and how it is related to poverty. This is done in Section III. The other side of the picture is how such seasonality influences

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the decisions of allocation of labour in agriculture. A related question is how the forms of labour hiring in the labour market respond to such seasonality. These are discussed in Section IV. Decision of labour allocation in non-agricultural activities has to take the seasonal pattern of labour use in agriculture into account. This is also discussed in brief. In the final section, we summarise our discussion.

To illustrate our arguments, we shall use data from two villages in Bangladesh. Data relates to the Bengali calendar year corresponding to April 1979 to April 1980. The two sample villages are Dhanbari and Parannagar in Savar Thana of Dhaka district. The information is based on a complete enumeration of all households in the villages, the number of households being 107 in Parannagar and 178 in Dhanbari. For each household, information was collected (with a one-shot questionnaire) on landholding, details of crops grown, labour used for different operations of the crops, cost and income from different occupations, food consumption, labour hiring practices etc. Detailed information was taken on the pattern of employment for all people actively engaged in income-earning. Some qualitative information on the cultivation practices and timing of different crops were also collected to supplement the quantitative data.[1]

II. NATURE OF SEASONALITY OF LABOUR USE IN AGRICULTURE

Labour use in agriculture and specially in crop production is highly seasonal because of the very nature of crop growing practices. The amount of work and attention required at different stages of plant growth are different. Labourdays required in each month or each operation for any crop will indicate the nature of such variation. To get the extent of variation we obtained monthly data on labour use in crop production for all farms in the two villages. The extent of variation as revealed by the coefficient of variation (Table I) is quite large.

The seasonwise distribution of labour use is shown in Table II. As can be seen from the table, total acreage and labour requirement is the lowest in *aman* season. This pattern however, is not consistent with the national picture where in the *aman* season, the amount of labour used as well as the acreage under crop is the highest amongst all seasons (Table III). It is however, interesting to note that in our sample villages, the deepest intra-season slack occurs in the months of *Bhadra* and *Aswin*

[1]Such detailed data collected on the basis of memory may suffer from the problem of memory lapse. But cross-checking within the questionnaire and with village-level information ensured workable reliability. Also our experience is that memory-based data have greater reliability if information is collected as disaggregated components, which we have done.

TABLE I

MONTHLY PATTERN OF LABOUR USE IN CROP PRODUCTION IN DHANBARI AND PARANNAGAR

Months	Village Dhanbari		Village Parannagar	
	Total Labour Used in Each Month	Labour Used in Each Month as% of Labour Used in Peak Month	Total Labour Used in Each Month	Labour Used in Each Month as% of Labour Used in Peak Month
Baishakh	4736.28	100.00	2082.44	92.19
Jaishtha	3308.66	96.86	2285.73	100.00
Asharh	2390.70	50.48	1810.85	80.17
Sravan	3372.29	71.20	1939.26	85.86
Bhadra	2899.66	61.22	1052.29	46.59
Aswin	564.23	11.91	468.14	20.73
Kartic	598.23	12.63	352.44	15.60
Agrahayan	1196.46	25.26	707.38	31.32
Poush	2321.16	49.00	1117.45	49.47
Magh	2260.03	47.72	739.89	32.76
Falgun	2172.25	45.86	964.13	42.68
Chaitra	2978.21	62.88	1140.15	50.48
Total	**28798.16**	—	**14660.15**	—
Coefficient of variation	48.05%	—	51.05%	—

Note : The index has been put at 100 for the month providing the maximum amount of employment.

TABLE II

PATTERN OF LABOUR USE IN DIFFERENT CROP SEASONS

Seasons	Dhanbari			Parannagar		
	Total Acreage under Crops	Labour Use in 100 Mandays	% of All Labour Use	Total Acreage under Crops	Labour Use in 100 Mandays	% of All Labour Use
Boro	206.50	137.78	46.34	114.50	49.22	34.10
Aus	131.28	115.54	38.86	110.58	86.09	59.65
Aman	78.31	44.00	14.80	29.44	9.02	6.25

which are within this *aman* season. This is true not only for these two villages but for many other areas of Bangladesh, as revealed by other studies [2 ; 3 ; 8].

TABLE III

SEASONAL LABOUR USE IN BANGLADESH AGRICULTURE

Season	Acreage under Crop (100 thousand)	Total Labour Use in Million Mandays	% of All Labour Use
Boro	56.16	487.87	19.46
Aus	93.66	785.97	31.35
Aman	142.60	1233.34	49.19

However, these analyses miss another dimension of the problem. Monthly data may not adequately reflect the intensity of the peaks and slacks. This is because, labour use may not be evenly spread out within a month. A description of the type of operations involved for a crop may help to clarify this point by revealing the true nature of seasonality in crop production.

The periods of rush are those when certain operations have to be performed within a limited period of time. In Table I, we have seen that at the beginning of the Bengali year, there is a marked peak in labour use. This is because, *Baishakh* and *Jaishtha* are the months of land preparation for *aus* and jute. Moreover, in certain areas the b*oro* crop is also harvested in *Baishakh* after which the land is prepared for *aus*. The combination of these operations account for the rush of activities in this period. Moreover, the work of land preparation for *aus* is very much dependent on weather. The land being dry and hard, it can only be ploughed after the first few showers of rain. When the rain starts, all the fields in an area have to be ploughed as soon as possible. Hired labour finds itself in great demand at that time, but supply is constrained as those labourers who have a tiny plot of land, give priority to their own plot. As a result, in this period, for a few days at least, there may be a severe scarcity of labour. This may again happen in the period of peak weeding and peak harvesting. In *Sravan* for instance, we find another peak of activities. In early *Sravan* the rush is due to the requirement of weeding of *aus* and jute, and the transplantation of the seedlings of *aman*. Transplantation, once started on a field, has to be completed as soon as possible so as to leave all the plants in the same stage of growth so that they can be treated with fertilizer, water etc. at the same time. On the other hand, when weeds start to grow in *aus* and jute land after the rains, most fields need simultaneous weeding. Also the nature of this task is such that if

it is not done fast, weeds start to multiply and require more labour. As a result, there is again a scarcity of labour in this period often resulting in attempts on the part of labour-hirers to bid away labour from each other, at least for a few days. The same may happen when a large acreage of *aman* needs immediate harvesting, as delay might result in significant loss of yield and output.

This description helps to show how labour shortage may be felt for a brief period although there may be a surplus when we consider a longer period such as a month or even a fortnight. Such shortage is due to the particular practices with respect to cultivation operations and their dependence on an uncertain monsoon weather.

III. SEASONALITY, UNEMPLOYMENT AND POVERTY

The seasonal pattern of labour use in agriculture as described in the earlier section will obviously give a seasonally fluctuating level of employment for workers of the village. But the data in Table I cannot show the exact magnitude of such fluctuation, firstly because, workers may be engaged in more than one occupation. They may also go out to other villages and seek work. Also people from other villages may have come to this village and contributed to the labour use as shown in Table I. Still we can use this data to assess the problem hypothetically. Given this labour use pattern, we can see how far labour force of this village would remain employed if they supplied all the labour required by the agricultural sector of the village. If we add up the labour used in both crop and non-crop agricultural activities, the monthly pattern of labour use turns out to be as shown by column 2 of Table IV. The number of workers who are engaged in agriculture as their main occupation are 184 and 88 in Dhanbari and Parannagar respectively. If they are taken to constitute the total supply, we can estimate a hypothetical surplus for each month. This is based on total labour demand in the agricultural sector of this village. On the other hand, we have data for agricultural work actually done by the workers of this village. If we compare the potential with the actual supply of labour by those whose major occupation is agriculture, we get the potential surplus among these workers. These are presented in Tables IV and V.

As may be seen from the Tables, the percentage of hypothetical suplus assumes a very high positive value in some months and a high negative value in others. This indicates that a village cannot be self-contained with respect to labour use, because in that case the workers will not be able to cope with the work in the peak period. On the other hand, in the slack season they will be almost idle and this

TABLE IV

A COMPARISON OF HYPOTHETICAL AND POTENTIAL SURPLUS LABOUR IN AGRICULTURE IN DHANBARI

Month	Mandays of Labour Use in Agriculture in Dhanbari (L_i)	% Hypothetical Surplus Lab. $\frac{(S_i - L_i) \times 100}{S_i}$	Mandays of Agricultural Work Done by Workers of Dhanbari (A_i)	% of Potential Surplus $\frac{(A_i - S_i) \times 100}{S_i}$
Baishakh	6313	—55.96	3657	9.66
Jaishtha	4410	—8.95	4145	—2.40
Asharh	3187	21.27	2889	28.63
Sravan	4495	—11.05	3131	20.18
Bhadra	3865	4.51	2901	28.44
Aswin	752	81.42	2099	48.15
Kartic	797	80.30	2743	32.21
Agrahayan	1595	60.60	3309	18.26
Poush	3094	23.50	3059	14.43
Magh	3017	25.48	2429	40.04
Falgun	2896	28.47	2660	34.29
Chaitra	3970	1.93	2927	37.59

Note : S_i=workers whose major occupation is agriculture×22 days and S=184×22 days in Dhanbari.

implies that they have to resort to some sort of occupational diversification and intervillage migration to seek work.

These results indicate that it may not be easy to withdraw surplus labour from agriculture, though a large amount of seasonal surplus exists.

How far such surplus is balanced by supplementary activities is revealed by an account of total employment in all types of activities. In rural areas non-agricultural activities are also seasonal, either by their very nature or because they are consciously taken up to counteract agricultural seasonality. The resultant picture is given in Table VI.

The extent of variation in monthly unemployment, as given by this tota picture is much less pronounced than what we found in agriculture alone. The

TABLE V

A COMPARISON OF HYPOTHETICAL AND POTENTIAL SURPLUS LABOUR IN AGRICULTURE IN PARANNAGAR

Month	Mandays of Labour Use in Agriculture in Parannagar (L_i)	% of Hypothetical Surplus Labour $\frac{(S_i-L_i)\times 100}{S_i}$	Mandays of Agricultural Work Done by Workers of Parannagar (A_i)	% of Potential Surplus $\frac{(A_i-S_i)\times 100}{S_i}$
Baishakh	2775	—43.34	2496	—28.93
Jaishtha	3047	—54.39	2580	—33.26
Ashar	2414	—24.69	1738	10.23
Sravan	2585	—23.52	1800	7.02
Bhadra	1402	27.58	1259	34.97
Aswin	624	67.77	1041	46.23
Kartic	469	75.77	1490	23.04
Agrahayan	942	51.34	1698	12.29
Poush	1489	23.09	1314	32.13
Magh	986	49.07	1191	38.48
Falgun	1285	33.63	1515	21.74
Chaitra	1520	21.49	1991	22.98

Note : S_i=number of workers engaged in agriculture as major occupation×22 and S=88×22 mandays.

coefficient of variation of this actual monthly surplus is only about 8% in both the villages.

For a fuller utilization of this unemployed labour time, it is useful to identify the extent of underutilization that is due to seasonality alone and the part that is due to non-seasonal reasons.

The proportion of unemployment in the month with the lowest unemployment can be taken as the measure of unemployment due to non-seasonal reasons (u_p). For other months, from the percentage of unemployment (u_i) we can subtract u_p and get the proportion of seasonal unemployment. Table VII presents these

TABLE VI

A PICTURE OF ACTUAL MONTHLY UNEMPLOYMENT AMONG WORKERS IN THE TWO VILLAGES

Months	Dhanbari			Parannagar		
	Total Days of Employment (E_i)	Average Employment per Member of Labour Force	Rate of Unemployment $\frac{(S_i-E_i)\times 100}{S_i}$	Total Days of Employment (E_i)	Average Employment per Member of Labour Force	Rate of Unemployment $\frac{(S_i-E_i)\times 100}{S_i}$
Baishakh	6403	19.64	10.72	4165	20.02	8.98
Jaishtha	6620	20.31	6.70	4060	19.52	11.28
Ashar	5263	16.14	26.62	3441	16.54	24.80
Sravan	5661	17.36	21.07	3492	16.79	23.69
Bhadra	5181	15.89	27.76	2928	14.08	36.01
Aswin	5039	15.46	29.74	2942	14.14	35.71
Kartic	5831	17.89	18.70	3441	16.54	24.80
Agrahayan	6348	19.57	11.49	3589	17.25	21.57
Poush	6458	19.81	19.95	3464	16.65	24.30
Magh	6186	18.97	13.75	3423	16.46	25.20
Falgun	6604	20.26	7.92	3685	17.72	19.47
Chaitra	6430	19.73	10.35	3694	17.76	19.27
Total	72024	220.93	16.31	42324	203.48	22.92

Note : S_i =is 326x22 mandays for Dhanbari and 208×22 for Parannagar.

figures. In most of the months and for the year as a whole, seasonal unemployment is found to be more important than non-seasonal unemployment. About 8.6% and 13.4% of unemployment, in Dhanbari and Parannagar respectively, is due to seasonal factors, which is greater than the non-seasonal unemployment of 7.7% and 9%.

Unemployment receives attention both because of its implications for under-utilisation of labour force and for the consequent poverty. Here we discuss how such seasonal unemployment is realated to the incidence of poverty. In most of the past literature on poverty, the seasonal dimension of it is missing. Whether people are in a poverty situation is assessed by comparing the yearly income or

TABLE VII

EXTENT OF SEASONAL UNEMPLOYMENT IN EACH MONTH

Months	% of Labour Supply Rendered Surplus Due to Seasonality	
	Dhanbari	Parannagar
Baishakh	3.02	00
Jaishtha	00	2.30
Asharh	18.92	15.82
Sravan	13.37	14.71
Bhadra	20.06	27.03
Aswin	22.04	26.73
Kartic	11.00	15.82
Agrahayan	3.79	12.59
Poush	2.05	15.32
Magh	6.05	16.22
Falgun	0.22	10.49
Chaitra	2.65	10.29
Total	8.62	13.94

consumption level with a desirable minimum requirement. If people live below that norm for some months and go above in others, the yearly average may not show them as poor or undernourished. Yet seasonal undernourishment may have permanent implications for health and well-being. There are in fact evidences of loss of body weight by adult males and females due to seasonal malnutrition [7].

It is also of interest to note that the seasonality of employment has different implications for poverty for different groups in the rural areas. In particular we have found that seasonal unemployment has different significance for the wage workers and the self-employed. Table VIII shows the monthly variation of wage employment and self-employment in agriculture for the workers of the two sample villages.

It is clear from the table that the wage-workers face a much more serious fluctuation in employment compared to the self-employed. The average employment

TABLE VIII

MONTHLY PATTERN OF AGRICULTURAL EMPLOYMENT FOR WAGE-WORK AND SELF-EMPLOYMENT

Name of Month	Dhanbari		Parannagar	
	Average Days of Wage Employment per Worker	Average Days of Self Employment per Worker	Average Days of Wage Employment per Worker	Average Days of Self Employment per Worker
Baishakh	15.38	7.30	14.50	10.52
Jaishta	17.26	8.37	15.74	10.48
Asharh	12.14	5.78	9.63	7.57
Sravan	12.96	6.81	10.21	7.71
Bhadra	11.72	6.11	6.61	5.67
Aswin	6.18	5.71	2.51	6.23
Kartic	7.67	7.69	4.35	8.53
Agrahayan	12.00	7.70	7.89	8.19
Poush	10.22	7.63	4.90	6.96
Magh	7.00	6.68	3.74	6.68
Falgun	7.45	7.45	3.81	8.99
Chaitra	6.68	7.31	2.89	9.30
All Year Total	**126.64**	**84.53**	**86.76**	**96.80**
Standard Deviation	3.47	0.80	4.28	1.50
Coefficient of Variation	32.91%	11.36%	59.11%	18.62%

for a wage-worker is perilously low in some of the months. The problem is compounded by the fact that in periods of slack, the wage rates are also very low, leading to acute seasonal poverty. Some respite is of course provided by alternative employment opportunities. Yet as Table IX shows, the problem of seasonal unemployment and poverty is not entirely removed.

In contrast to the wage workers, the monthly pattern of employment and unemployment is quite uniform for the self employed. So the question naturally arises as to whether such uniformity means that the problem of seasonal poverty is

TABLE IX

AVERAGE MONTHLY EMPLOYMENT FOR LANDLESS (NO CULTIVATED LAND) WORKERS IN THE TWO VILLAGES

Month	Average Mandays Worked (all types of work) in Each Month	
	Dhanbari	Parannagar
Baishakh	22.6	24.5
Jaishtha	22.6	24.2
Asharh	19.3	19.5
Sravan	19.8	20.3
Bhadra	18.4	17.2
Aswin	17.2	16.6
Kartic	18.1	18.8
Agrahayan	21.2	21.3
Poush	21.4	21.5
Magh	21.0	20.7
Falgun	22.6	20.8
Chaitra	21.2	20.5

not relevant for them. It is clear that for this group seasonal poverty does not operate through seasonal unemployment. However, there are other influences of seasonal agriculture on their income. Their income is derived from the agricultural produce which comes at the end of a crop season. Such seasonal production may cause problems in the following ways :

For many small and medium farmers the amount of produce may be inadequate for the next season. Even if it is adequate, some of it may have to be sold at a low price in the immediate post-harvest period due to lack of storage facility and again bought back at a higher price at a later date. Moreover, immediately after harvest, consumption may be greater than the minimum requirement, which may cause a shortage towards the end of the season. To meet such shortage the small farmer may not be able to go to other villages to seek alternative employment because he has to attend to his own farm even though there is very little work to do. Also

the food shortage occurs just before the harvest of next crop, which may have adverse effect on efficiency as well, as this is the time for hard work. Thus the more uniform pattern of self employment in agriculture may in fact accentuate seasonal poverty rather than eliminate it.

The seriousness of the problem will obviously depend on the cropping intensity, which determines the periodicity of harvest. The scope of non-agricultural employment nearby is also important in balancing the seasonal shortages. About 17.5% of farmers with cultivated land of less than one acre face food shortage in Dhanbari. On the other hand, 33.3% of farmers in this group face shortage in Parannagar. Such shortage occurs during the months of *Aswin* and *Chaitra* in most cases. It may however be mentioned that food shortage and poverty in the villages is almost always a seasonal phenomenon. Shortage around the whole year is faced by only a few families who are either beggar and or do not have any male in the working age group. The attention of those who are conversed with studies related to poverty, on the basis of average calories consumed during a year, should be drawn to the above facts.

IV. SEASONALITY AND LABOUR ALLOCATION

Labour allocation, as it is guided by considerations of marginal product and wage rate, will be influenced by seasonal factors. Seasonality assumes importance in this context due mainly to the technical point that the marginal product of labour input for a given crop is not the same in its various stages of growth. In other words, labour input in peak and slack seasons are not perfect substituties. Corresponding to this variation in the marginal product of labour, there is also seasonal variation in the opportunity cost of labour. In our earlier description we mentioned how in some season there is a rush to complete the work, while in other months there is only a minimal amount of work available. As a result, wage rates in different months show some significant variation. In the case of use of family labour, the opportunity cost of the same also varies depending on the scope for alternative use which is clearly not the same in different parts of the year. Thus it is obvious that in different seasons, amount of labour used will be different. What we would try to investigate here are the following : (a) Whether the peaking of labour demand due to the seasonal factor makes the farmers face a labour constraint. (b) Whether slack season labour input is related to peak season input and in that case how seasonality may influence variation of total labour input. (c) How the characteristics of the rural labour market respond to such seasonal questions. (d) Lastly, we shall consider how labour allocation in non-agricultural activities in rural areas is related to seasonal agricultural employment.

Existence of a Labour Constraint

Densely populated Bangladesh with heavy pressure on arable land resulting in a low land-man ratio is often presented as a prime example of a labour-surplus economy. The discussion of a labour constraint may, therefore, sound irrelevant. But given the seasonal factor it may be useful to investigate the possibility of such a constraint which will be important for consideration if any labour intensive technology is introduced.

Labour constraint may be identified if for any particular period there is no unemployed labourer in the area. Monthly figure of percentage of unemployment may be an indicator of such constraint. But if the constraint is felt for an even shorter period, it will not be reflected in the monthly figure.

According to this sort of indicator, a labour shortage in the months of *Baishakh* and *Agrahayan* are prevailing in many parts of the country. Habibullah's study [1] gives negative unemployment or overwork in these months. In our own study, no single month is found to be fully labour absorbing. But given the very low percentage of unemployment in the peak month, we should perhaps go deeper to investigate the existence of a very short-period labour shortage. Shortage would usually be felt by larger farmers who depend more on hired labour. In the peak season there is a simultaneous demand for hired labour by all labour-hiring farms. On the other hand, some of the wage workers may be engaged in their own farms which will certainly come first in their order of priority. So we should see whether the wageworkers are fully employed in the peak month ; if they are, then this would indicate the possibility of a shortage. In our sample villages, landless workers, on the average, worked for 23 and 24 mandays in *Baishakh* and *Jaishtha* which are above the full employment level which we normally take as 22 workdays in a month.

On the other hand labour constraint may be assessed more directly by asking the employers whether they faced any problem in getting adequate number of labourers when they needed them most. We can cite one study where such a direct enquiry was carried out. For a village in Comilla it was found that 20% of the large farmers (cultivating more than 5 acres) faced problem in getting as much labour as they wanted [1].

That this happens may not be due to total labour demand exceeding supply even in the peak one-week period. This is more due to the nature of monsoon dependent cultivation practices which we described earlier. Some of the agricultural operations have to be performed simultaneously in all fields. Ploughing after the first few showers, or harvesting of the crop, are examples of such activities. So

for one or two days, everyone will be busy and a labour shortage may be faced or at least feared. That is how there may be a labour shortage due to seasonal factors in a situation in apparent labour abundance.

Seasonal Labour Shortage and Allocation of Total Labour

In the last section we saw that there exists a possibility of seasonal labour shortage in the rural areas even if there exists a large seasonal unemployment as well. Now, such shortage will obviously reduce the total amount of labour used, by the amount of shortage. But the problem goes beyond this. Total labour input may be reduced even more in the following ways. (1) In the fear of shortage of labour, specially the large farmers who depend mostly on hired labour will try to adjust their production plan in favour of less labour-using crops. (2) They may even opt for a lower cropping intensity. (3) For the same crops, there is usually a complementarity between the labour use in different seasons. If in the period of rush, labour use is lower, this may reduce labour use in other periods. For example, a less intensive weeding may reduce yield and thus reduce the labour requirement in harvesting season.

Empirical evidence on each of these aspects is lacking. We can cite a few studies which give some relevant information. Ahmed [1] from a direct enquiry in a village found that the large farmers faced a problem in hiring labour. In that village it was observed that the larger farmers devoted a lower percentage of their land to labour-intensive crops as compared to the smaller farmers.

They also show a lower cropping intensity. A lower cropping intensity among the large farmers is evidenced by a variety of studies [4 ; 5 ; 9]. However, how far such lower cropping intensity is due to seasonal scarcity of labour and how far other factors account for the difference remains to be investigated.

It is quite plausible that labour use in different operations will show complementarity. For example, yield and therefore labour for harvesting is expected to show some dependence on the amount of labour used in other operations, such as ploughing, weeding etc. But more importantly yield depends on other inputs such as fertilizer and on natural conditions such as amount and timing of rains. So it will be difficult to establish empirically the interrelation of labour use in different operations. If we include other variables as well, there will be strong multicollinearity among the dependent variables. That is why our own data and Khan's [5] study fails to show significant dependence between labour use in different operations. But the possibility still remains.

Labour Constraint and Responses in Labour Market

We have seen that seasonality of agricultural operations imposes a constraint of availability of labour at some points in time. Even if there is no actual shortage, there is a fear of the same. This leads to different responses in the behaviour of the farmers affected by such shortage. Apart from their own responses, the labour market will try to adjust to take care of the problem. Following aspects are relevant in this respect.

We have seen that the nature of seasonality of agricultural work is such that sometimes it requires a large number of workers simultaneously on the field. It is not possible for permanently attached labourers to cope with this work. That is why there is always a residual dependence on casual labour. But in periods of urgency all the casual labourers are busy and to contact such a large group of workers within a short period of time may be difficult. Sometimes there may be a problem of supervising whether the daily worker is working intensively.

Terms and forms of labour hiring seen in the rural areas provide some answer to these problems. In busy periods, specially when the job needs to be done within a day or two, the workers are hired on contract to complete that work within the specified period. Wages are paid at a fixed rate for the completion of the work and not on the basis of days required. So it is in the interest of the worker to complete the job quickly. They usually work for longer hours and more intensively. This type of contract is usually seen for harvesting and sometimes for ploughing. Such contract for harvesting is given to a group and not individually. The workers themselves form into groups and approach the potential employers. In the two villages studied by the author this sort of terms of labour-hiring was used extensively. In the case of *boro* almost all harvesting was done by groups on contract basis. Same was the case with *aman*. *Aus* and Jute do not necessitate such a hurry for completion. So the harvesting is mostly done on daily basis. In cases of 'contract harvesting' of different crops in these villages, the hours worked and wage rates were quite high. These are shown in Table X. Daily wage rates are higher not only because they work longer hours but the hourly wage is also higher than during other periods. In fact this provides the incentive of overtime work when the job is strenuous. Thus this form of contract reduces the problem of getting a large group of people simultaneously. Also this helps to increase the supply of labour in the critical period by making the workday longer. This sort of arrangement attracts labourers from distant deficit employment areas to areas with high yield and employment opportunities. Such groups are reported to move long distances. This also helps to reduce regional imbalance in seasonal labour demand.

TABLE X

WAGE RATES IN HARVESTING SEASON

Crop	Daily Earning		Average Hours Worked per day		Wage Rates of Eight Hours (one manday)	
	Dhanbari	Parannagar	Dhanbari	Parannagar	Dhanbari	Parannagar
Boro HYV	28.16	*—	10.88	—	20.71	—
Aus	14.85	21.55	10.25	11.42	11.59	15.10
Aman	18.78	*—	10.48	—	14.34	—

*Only a small number of farmers grow these crops in Parannagar. So cases of contract harvest is very small.

Seasonality of Labour Use in Agriculture and Allocation of Labour in Non-agriculture

Seasonal pattern of agricultural activity not only influences labour allocation in agriculture but also that in non-agriculture. Many of the non-agricultural activities are seasonal by their nature, e.g., fishing, transport (in non-metalled roads and canals) etc., and they create a seasonal demand for labour. On the other hand, certain activities are consciously developed to take advantage of the surplus labour from agriculture in the slack season.

We shall focus on two issues of importance in connection with the relationship between seasonal labour allocation pattern in agriculture and non-agriculture.

(1) How far non-agricultural employment is seasonal and whether they counteract the seasonal pattern of agricultural employment.

(2) How to plan the development of seasonal non-agricultural employment to counteract agricultural seasonality. Non-agricultural activities in rural areas are most often supplementary to agriculture both in terms of employment and income. This is true specially for wage workers and their marginal activities. As a result these activities will be seasonal and the pattern of seasonality is expected to be counteracting that of agriculture. Table XI shows the pattern of employment in non-agriculture in the sample villages, for the self-employed and wage workers separately. It is observed that the pattern is almost stable for the self-employed. For wage-workers it is quite seasonal and the pattern is such that it counteracts agricultural seasonality. Thus the agricultural wage-workers get an opportunity to at least partially even out their employment pattern.

The obvious policy implication of the observed pattern given in Table XII is to develop non-agricultural activity to employ workers in the agricultural slack season. Planning of these activities has to take agricultural seasonality into proper consideration.

TABLE XI

MONTHLY PATTERN OF NON-AGRICULTURAL EMPLOYMENT FOR WAGE WORK AND SELF-EMPLOYMENT

Serial Number and Name of Month	Dhanbari		Parannagar	
	Average Days of Wage Employment per Worker	Average Days of Self Employment per Worker	Average Days of Wage Employment per Worker	Average Days of Self Employment per Worker
1. *Baishakh*	9.20	16.37	12.47	11.41
2. *Jaishtha*	7.34	15.48	10.28	11.11
3. *Asharh*	6.90	15.36	11.47	13.25
4. *Sravan*	7.09	15.70	11.12	13.52
5. *Bhadra*	6.56	14.75	11.28	12.93
6. *Aswin*	10.73	16.52	13.79	13.52
7. *Kartic*	12.39	16.06	15.85	11.72
8. *Agrahayan*	12.01	16.01	14.77	12.11
9. *Poush*	14.90	16.23	17.87	12.36
10. *Magh*	17.17	17.16	18.60	12.80
11. *Falgun*	17.64	18.43	16.94	13.92
12. *Chaitra*	17.62	17.92	16.92	14.47
Standard Division	4.16	0.98	2.81	.99
Coefficient of Variation	35.79%	5.99%	19.67%	7.80%

Non-agricultural activities whether they are regular all season work or seasonal activity will have to depend on labour time supplied by workers engaged in agriculture as well. More than ninety per cent of all workers of the villages are employed in agriculture for some part of the year. We also discussed that there is a possibility of some constraint in the availability of labour in the period of peak agricultural

activity. These two imply that the use of rural labour in non-agricultural activities even wthin the location of their residence is not without an opportunity cost. If the opportunity cost of labour given by shadow price is calculated from the rate of unemployment and prevailing wage rate, such cost will be different for peak and slack season. The use of the percentage rate of unemployment over the year and the average wage rate will give a distorted picture. In a season of scarcity, rate of unemployment will be zero and any withdrawal of labour will affect productivity. This effect is lost sight of when the unemployment rates are averaged. So a project, when selected on the basis of such consideration, will either create a problem of labour availability in agriculture or suffer from the scarcity of labour itself.

In view of these considerations, it seems necessary that the scale of non-agricultural activities must be different in different periods of the year. Many of the construction activities, undertaken both publicly and privately, are of this nature. These are done mainly in the winter when agricultural activities are small in quantity. But a major problem of such activity is that they cannot fill the gap during the rainy season. The reason of this is two-fold. Most seasonal activities like construction are dry-season activities by their very nature. On the other hand, the length of the slack season during late monsoon is less than two months only, nearly half of the slack season in winter. So even if suitable rainy season activities are developed, they may go beyond the slack season and cause problems in the harvesting of the main crop of the country, namely *aman*. So the policies should be aimed at increasing agricultural activity during this season in such a way that the pre-slack employment is adequate to provide enough income to sustain the workers during this slack.

V. SUMMARY AND CONCLUSIONS

We shall now summarise our main findings, some of which have obvious implications for policy.

It is observed that labour use in agriculture is highly seasonal, showing large variation over the months and among different crop seasons as well as within a season.

Most types of non-agricultural activities are also seasonal, but they often counteract the seasonality of agricultural employment and this type of occupational diversification helps to reduce the seasonality of employment. But still the aggregate pattern of employment and unemployment is one of substantial fluctuation. When seasonal and non-seasonal components of unemployment are separated, the magnitude of seasonal unemployment is found to be much larger.

Such unemployment means that there is substantial underutilization of labour force and at the same time they cannot be withdrawn to be employed elsewhere. Apart from implications of such underutilization of labour force, the more important reason for concern about seasonal unemployment is that it causes intense poverty over certain parts of the year.

We have examined that the other implication of such seasonal labour use is the possibility of a seasonal labour constraint which may also influence the total labour used on crops. Such constraint has led to various responses in the labour market, such as the use of contract labour, temporary intervillage migration of labour force etc. Given the possibility of both a labour scarcity at some point of time and seasonal unemployment at others, non-agricultural projects designed to absorb this labour supply have to be planned very carefully.

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Note

A Layman's Geometric Proof of the Nonexistence of "Marshallian" Share-cropping Contracts*

by

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Though it has been long suspected—but only recently formally demonstrated—that under the so-called 'Marshallian' setting[1] and under certain conditions which are commonly assumed in the literature, the sharecropping contracts cannot exist, irrespective of whether the land market is competitive, monopolistic or imperfectly competitive, the issue has often been a source of misunderstanding even among the leading authors in this area [1; 6]. A formal demonstration of the nonexistence of Marshallian sharecropping has recently been provided by Bell and Braverman [2] (henceforth called B-B). Though their mathematical proof is fairly straightforward, it may seem complicated to many—especially those who limit themselves only to the Marshallian marginal and average curves. The purpose of the present note is to provide a very simple geometric proof of the nonexistence in an intuitive fashion—based on a diagram of the Marshallian pedigree. We hope the present demonstration should be accessible to a wider audience.

We briefly recapitulate the 'Marshallian' assumptions as stated by B-B. First, the landlord can either hire labour in a competitive labour market at an exogeneously

*I am grateful to Wahid Mahmud, Mustafa Alam, M. Muqtada and S. Mushtaq Ahmed for very helpful discussions. I am also indebted to the participants in the Arthaniti-Charcha-Kendra Seminar at the University of Dhaka for useful comments, and to Avishay Braverman for giving me access to his unpublished works on sharecropping.

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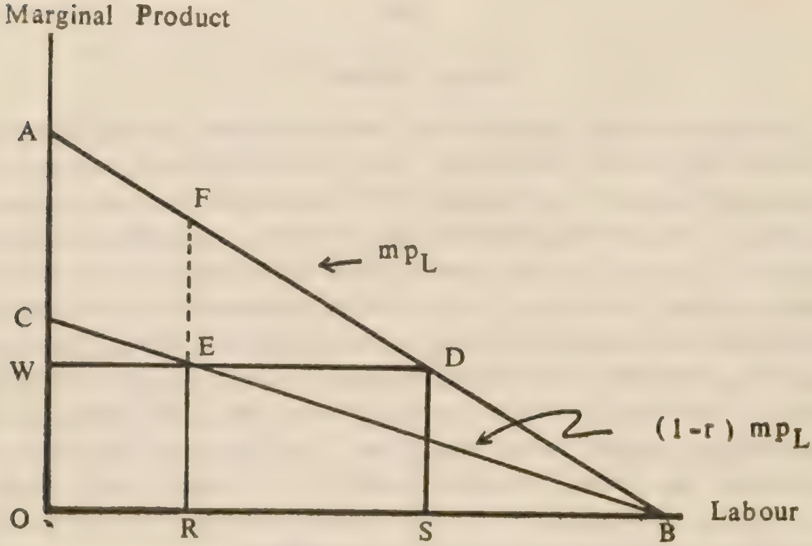
1That Marshall [5] himself was not a full-fledged 'Marshallian' can be understood from reading his full text rather than the technical footnote. But unfortunately his technical foot-note, which was intended to illustrate the incentives problem rigorously, has come to be known as the 'Marshallian theory' of sharecropping. Indeed, Marshall's theory of sharecropping, which was a rich version of the classical theory of sharecropping, recognized the importance of share-contracts in an environment dominated by *market imperfections* or *absence of certain markets*. See Bliss and Stern [3] for a discussion of this issue.

given wage rate w, or lease out land to the sharecropper at a given share rental r or both. Secondly, the production function is the same for both the landlord and the tenant ; it is a constant-returns production function with diminishing marginal productivity for both land and labour. Thirdly, the landlord cannot force the labour intensity on the tenant land like the Cheungian landlord. Fourthly, there is no monitoring or supervision costs for hired labour. And finally, the landlord and the tenant are profit maximizers.

GEOMETRIC DEMONSTRATION



Diagram

Assume that the landlord has a unit of land at his disposal. AB is the marginal productivity of labour (mp_L) curve and BC is the share of the marginal productivity of labour [$(1-r)\ mp_L$] received by the sharetenant. Now if the landlord self-cultivates the land with hired labour, then the market wage rate being OW, he hires labour upto OS. In this situation, the total output from land is OSDA, of which OWDS goes as the wage-bill and the remaining AWD accrues to the landlord as his profit. Now instead of self-cultivating, if the landlord decides to sharecrop, then we show that his profit will be lower than in the self-cultivation case. With sharecropping, the tenant, being a profit-maximizer, will devote labour up to OR, where the equality $(1-r)\ mp_L = W$ holds. At this point, the total output is given by ORFA and the

share by tenants' OREC. The remaining CEFA accrues to the landlord. Now one can immediately see that CEFA, being a part of AWD, is always smaller than AWD. Then, under the above circumstances, the landlord will always find it more profitable to selfcultivate than sharecrop.

Two remarks are in order. First, it should be intuitively obvious that the landlord will prefer a strategy of pure-wage cultivation to a strategy of mixed cultivation where he self-cultivates a portion of land with hired labour and rents out the rest. For, in this case, corresponding to each portion of sharecropped land, there is a dominating strategy of wage-cultivation, yielding a higher profit. Secondly, the above conclusion of nonexistence seems to have a nihilistic implication : if the usual inefficiency argument about sharecropping is true, it would also imply the nonexistence of sharecropping as a contractual form. Therefore, the impetus of sharecropping —which is persisting notwithstanding the admonitions of distinguished economists for centuries—has to be searched elsewhere—like in nonexistent or incomplete markets, imperfect market structures, multiple independent sources of risk etc.[2]

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[2]The newly emerging literature in this area seems to take account of these factors. For a sample of this literature, see Braverman and Stiglitz (forthcoming) and references cited therein.

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Directory of Non-Governmental Organizations in OECD Member Countries Active in Development Co-operation, Vol. I : Profiles (741 pp.) ; Vol. II ; Index (773 pp.), *OECD, Paris, 1981, French Franc 290, US $ 64, UK £ 29 or Deutsche Mark 145. Available from the OECD Publications Office, 2 rue Andre-Pascal, 75775 Paris Cedex 16, France.*

Private voluntary agencies in OECD countries provided aid worth nearly US $2.4 billion to developing countries in 1980. This was equivalent to an average of $ 3.50 per capita in the 17 Member countries of OECD's Development Assistance Committee (DAC), according to data assembled by the DAC Secretariat and summarized in the table.

The two-volume, 1500-page Directory of NGOs just published by the Development Centre-the first to be compiled since 1967—lists 1702 NGOs based in OECD countries and describes the nature, scope and geographic location of their activities. Each profile includes information on the organization's name in various languages, the addresses of its offices, its aims, affiliations, publications, staff expenditures and sources of finance.

The Directory's data base—provided for, to a considerable extent, by the NGOs themselves —establishes a most useful distinction between what belongs to project funding and implementation and what belongs to development education : information campaigns, policy-oriented lobby, etc.

The Directory has two aims : to facilitate contacts and improve co-operation among the NGOs themselves, and to assist planners and decision makers in the Third World to identify appropriate sources of aid. It was derived from a computerized data base which is at the disposal of governmental and non-governmental institutions for documentary research.

There are many ways in which the Directory can be used, from indentifying a specific donor country's NGOs involved in co-operative farming to finding out how many NGOs run exhibitions in their own countries or analysing the spread of NGO activity in a given recipient country.

Grants by private voluntary for development purposes 1980

	$ million	**$ per capita**	**NGO grants as a % of ODA**
Australia	39.7	2.71	6.0
Austria	23.5	3.13	13.6
Belgium	45.0	4.57	7.7
Canada	102.0	4.26	9.8
Denmark	12.9	2.52	2.8
Finland	15.5	3.24	14.6
France	35.7	0.66	0.9
G ermany	420.7	6.83	12.0
Italy	3.1	0.05	0.5
Japan	26.4	0.23	0.8
Netherlands	78.7	5.56	5.0
New Zealand	6.8	2.17	
Norway	33.0	8.07	9.6
Sweden	56.0	7.09	6.4
Switzerland	63.2	9.92	25.7
United Kingdom	104.7	1.87	5.9
United States	1301.0	5.84	18.2
Total DAC	2370.9	3.54	8.9

Source : DAC/OECD

N.B. : ODA=Official Development Assistance.
Grants by voluntary agencies are not included in data on official development assistance or bilateral ODA
Data as of November 1981.

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Some Macroeconomic Implications of Higher Oil Prices for Bangladesh

by

RIZWANUL ISLAM*

The paper analyses the impact of the steep rise in oil prices that has taken place since 1973 on the terms of trade, balance of trade and the capacity to pay for imports out of export receipts of Bangladesh. It shows that the country would have faced a deteriorating terms of trade even in the absence of such a rise in oil prices, but this phenomenon has made things much worse for her. Not only her terms of trade deteriorated severely, her major exports suffered a setback and the reduced capacity to pay for imports led to a shrinking of the volume of crucial imports. The additional cost of imports due to higher oil prices was also quite substantial in relation to the country's GDP, its growth and exports. Thus the rise in oil prices seems to have made substantial contributions to the country's impoverishment during the seventies.

I. INTRODUCTION

There is no domestic supply of oil in Bangladesh and no reserves of oil have yet been found in the country. Obviously, all the oil comsumed in Bangladesh must be imported from abroad. Hence any change in the international oil market is bound to have a direct effect on the economy of Bangladesh. It may, therefore, be useful to analyse the implications for the economy of Bangladesh of the unprecedented rise in oil prices that took place since the latter half of 1973. It can be easily surmised that the most immediate impact of this price hike must have been on the balance of payments and terms of trade of the country. Apart from these macroeconomic implications, the various sectors of the economy must have been affected in varying degrees depending on the extent and nature of their dependence on oil. The present paper, however, concentrates on the macroeconomic implications only. Before taking up these issues in section III, we provide a background to the problem in section II. The final section presents some concluding observations.

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II. THE BACKGROUND

The Energy Scene in Bangladesh

The main sources of energy used in Bangladesh can be broadly categorised as 'commercial' and 'non-commercial'. The first category includes coal, oil, natural gas and hydro-electric power. The main sources of non-commercial or traditional fuel are crop residues (e. g., rice hull, jute sticks, and rice straw) and dried cow-dung.[1] It may be interesting to

TABLE I

SUPPLY OF ENERGY IN BANGLADESH BY SOURCES, 1973/74

Sources	Amount Supplied (in 10^{12} BTU)	(Percentage of Total)
Commercial Sources		
Coal	5.3	(2.0)
Oil	36.0	(13.6)
Gas	7.1	(2.7)
Electricity	16.7	(6.3)
Sub-total	65.1	(24.6)
Non-commercial Sources		
Cow-dung	50.0	(18.9)
Jute sticks	12.0	(4.5)
Rice straw	36.0	(13.6)
Rice hulls	48.0	(18.1)
Bagasse	11.0	(4.1)
Firewood	7.0	(2.6)
Twigs, leaves	18.0	(6.8)
Other wastes	18.0	(6.8)
Sub-total	200.0	(75.4)
Grand Total	265.1	100.0

Source : [10].

[1] Some of these do have a market in Bangladesh, and hence, cannot be called non-commercial in a strict sense.

note that a large part of all energy consumed in Bangladesh is still derived primarily from these traditional or non-commercial sources. In 1973/74, for example, commercial fuel sources accounted for less than one-fourth of the total energy supply. Table I gives a detailed breakdown of the various sources of energy supply in Bangladesh.

It is clear from Table I that only 14 per cent of the total recorded energy consumption in Bangladesh is derived from oil. However, in respect of commercial energy only, oil is the most important source, contributing more than 55 per cent of the total supply.

An examination of the pattern of oil use in Bangladesh reveals interesting features. The largest user of oil is the domestic sector accounting for more than 30 per cent of the total oil consumption. Next in importance comes the industrial sector, followed by the transport sector (see Table II).

TABLE II

USE OF OIL IN BANGLADESH BY SECTORS, 1973/74

Sectors	Oil Used (in 10^{12} BTU)	(Percentage of Total)
Agriculture, forestry and fisheries	1.35	(3.75)
Manufacturing and construction	10.28	(28.56)
Transport	8 13	(22.58)
Household and other sectors	16.24	(45.11)
Total	36.00	100.00

Source . [10].

However, oil accounts for less than one-third of the total consumption of commercial energy by the industrial sector. Another interesting fact is that oil consumption in this sector is dominated by a few large users like iron and steel, paper and paper products, and jute textiles—these industries together consume more than 50 per cent of the oil consumed by the entire industrial sector.[2]

The Rise in Oil Prices

The unprecedented rise in oil prices started in mid-October 1973, when nine out of the ten Arab petroleum exporting countries agreed to

[2]Data presented in this and the earlier paragraph are taken from [10].

restrict their exports in total and to prohibit altogether exports to certain countries ; at the same time, the Gulf members of the Organization of Petroleum Exporting Countries (OPEC) decided to raise the Gulf posted prices by 70 per cent. They also established a link between posted prices and market prices under which the former would exceed the latter by 40 per cent. The immediate impact of these actions in Bangladesh, as in other oil-importing countries, was an upward movement in the price of crude oil. Trade data indicate that the prices of petroleum and petroleum products (POL products) in Bangladesh registered an unprecedented increase between the later half of 1973 and the first half of 1975. For example, the import price of crude petroleum which was $ 2.34 per barrel in January 1973, rose to $ 8.50 per barrel in September 1974 and reached $ 10.87 by March 1975.[3] Table III shows the movement of import prices of crude petroleum and petroleum products over the period 1969/70 to 1978/79.

TABLE III

MOVEMENT OF IMPORT PRICES OF CRUDE PETROLEUM AND PETROLEUM PRODUCTS IN BANGLADESH 1969/70* to 1978/79*

Year	Price of Crude Petroleum (dollars per ton)	Price of Petroleum Products (dollars per ton)
1969/70	18	25
1972/73	22	50
1973/74	60	86
1974/75	121	124
1975/76	89	126
1976/77	103	121
1977/78	108	127
1978/79	124	157

Note : * Years refer to fiscal years (July-June).

Source : [5], 1975/76 and [6].

It should also be mentioned that the result of the increase in crude oil prices at source was not confined to an increase in the import price of oil and oil products ; the prices of other commodities which are linked up with those of POL products also went up. Table IV shows the changes in the prices of some important imported commodities.

[3]Data taken from [5], 1974/75.

We see from Table IV that after 1972/73, the import prices of commodities other than petroleum and petroleum products also registered substantial increases. Between 1972/73 and 1975/76, for example, prices of important import items like rice, cotton yarn, fertilizers and cement

TABLE IV

PRICE INDICES OF SOME IMPORTED COMMODITIES IN BANGLADESH 1973/74 to 1978/79 (1972/73=100)

Items	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79
Rice	136	258	261	194	148	179
Wheat	160	171	154	125	101	132
Edible oil	135	158	140	110	141	161
Oil seeds	216	292	191	177	215	211
Crude petroleum	273	550	405	468	491	564
Petroleum products	172	248	252	242	254	314
Raw cotton	196	196	145	206	176	181
Cotton yarn	200	260	325	230	173	162
Fertilizer	142	271	244	133	171	208
Cement	215	370	225	235	240	295

Note: The figures are the indices of unit prices.

Source: [6, p. 25].

more than doubled or trebled. After a temporary lull of 1976/77, prices started rising again in 1978, and the 1978/79 prices of important import items like wheat, edible oil, oil seeds, fertilizers and cement either exceeded or reached close to the 1975/76 level. And this price increase had important implications for the country's terms of trade, balance of trade and the capacity to import. We shall now turn to an analysis of these impacts.

III. THE MACROECONOMIC IMPLICATIONS

The immediate impact of the rise in the prices of oil and related commodities has been on the external position of the country. In order to give an indication of the order of magnitude of such impacts, it may be convenient to distinguish two separate though related consequences brought about by these price increases.

First, the increase in oil prices can lead to a worsening of the terms of trade of an oil-importing country such as Bangladesh. This may

happen due to a rise in the import price index which in turn has been caused by the increased cost of petroleum imports as well as that of other imports.

But the direct impact of the higher oil price in raising import costs represents only part of the consequences. A lower volume of economic activity in the developed countries had led to a reduction in the volume of exports from Bangladesh. This reduction had an adverse impact on her foreign exchange earnings, and thus on her capacity to import and to support domestic investment.[4,5]

Secondly, the rise in oil prices has aggravated an already acute balance of payments of the country. The external financing problem has resulted mainly from the need to increase the flow of receipts of foreign exchange in order to meet higher total import bills. It is, therefore necessary to analyse the nature and magnitude of the balance of payments problem and examine whether there has been any difficulty in maintaining the flow of imports needed to maintain the production level of sectors which depend primarily on imported inputs.

Impact of Higher Oil Prices on Terms of Trade

The above discussion indicated that higher oil prices must have affected the import price indices of Bangladesh. And it is possible that in the wake of worldwide inflation that followed the rise in oil prices, the export prices of Bangladesh have also gone up to some extent. Thus the immediate impact of higher oil prices must have been on the terms of trade of the country. We shall examine the nature and magnitude of these effects by analysing the movement of terms of trade. For this purpose, we have selected the period 1972/73 to 1978/79. The earlier year has been selected as the base year, because the prices of oil and oil products started rising only towards the end of 1973. Necessary data were obtained from the Planning Commission and the Bangladesh Bureau of Statistics. The methodology used is described in the appendix.

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[4]This adverse effect could, of course, be compensated by an additional inflow of capital, But there is no evidence to show that a sufficient inflow of capital has actually taken place.

[5]The secondary repercussions of this reduction in exports must have been on domestic production and hence on employment. Some illustrations of such secondary repercussions can be found in [8].

Now, it is possible to isolate the impact of higher oil prices by calculating two sets of import price indices—one by including and the other by excluding the imports of oil and oil products—and comparing them. Such a comparison, however, would not reveal the true picture, because the outright exclusion of oil and oil products would prevent them from playing any role in the import price index although they have an important weight in the import bill. One way of allowing these products a place in the import price index and yet isolating the impact of their increased prices could be to calculate an import price index assuming that their prices in all years were the same as that of the base year. Accordingly, three sets of commodity terms of trade have been calculated. They are distinguished from each other as follows : (i) the first set includes petroleum products at current prices : (ii) the second set includes POL products but assumes that the prices in all subsequent years were the same as that in 1972/73 ; and (iii) the third set excludes POL products altogether. These three sets are presented in Table V.

The comparison between these three sets indicates the impact of rising oil prices on the terms of trade of the country. A comparison between sets 1 and 2, for example, indicates that even with constant prices of POL products, the country would have faced a substantial decline in her terms of trade. But it is clear from Table V that increases in the price of POL products have further aggravated the situation.[6] Moreover, it must also be mentioned that in this analysis we have not been able to isolate the terms of trade effect of other price increases caused by the rise in oil prices. If this latter impact could be isolated, the real effect of increased oil prices on the terms of trade of Bangladesh could be shown more clearly. It is probable, however, that the true impact is greater than that indicated by the difference between two sets of terms of trade presented in Table V.

In order to determine the extent to which the country has been made poorer by the increased cost of petroleum imports, we have tried to

[6]One might point out that the terms of trade improved after 1975/76 despite the fact that oil prices continued to increase. This clearly is due to the declining trend in the prices of many of the imports which started in 1975/76 and became more prominent in the two subsequent years. The trend might as well have been set by the temporary fall in oil prices during the same year. It may also be noted, however, that the import price index went up again in 1978/79 when the oil prices registered a big increase over the previous year and the prices of most of the other imports followed suit (see Tables IV and V).

TABLE V

TERMS OF TRADE FOR BANGLADESH (1972/73=100)

Year	Export Price Index	Import Price Index	Commodity Terms of Trade
Set 1			
1973/74	105	164	64
1974/75	127	226	56
1975/76	178	332	54
1976/77	213	304	70
1977/78	221	269	82
1978/79	274	327	84
Set 2			
1973/74	105	157	67
1974/75	127	206	62
1975/76	178	300	59
1976/77	213	266	80
1977/78	221	229	96
1978/79	274	279	98
Set 3			
1973/74	105	160	66
1974/75	127	213	60
1975/76	178	313	57
1976/77	213	277	77
1977/78	221	238	93
1978/79	274	291	94

Source : Calculated from data provided by (i) Foreign Trade Wing, Bangladesh Bureau of Statistics ; (ii) World Bank Resident Mission in Bangladesh and (iii) Planning Commission, Government of Bangladesh.

quantify some of the macroeconomic implications. Table VI summarizes the results. First we have calculated the additional cost of petroleum imports (for the years after 1972/73) which has been solely due to increased prices. This additional cost can be expressed as a percentage of national income. In 1974/75, for example, this additional cost was more than 2 per cent of the national income. It may be mentioned here that the rate of increase of national income during this year was only 2 per cent.[7] Thus we see that the increased cost of petroleum imports has more than eaten up the increase in national income during that year. During the next two years, the additional cost of petroleum imports as a percentage of national income increased further.

If we add the additional cost of other imports due to price rise, the implications are seen to be even more serious. It is of course true that not all this additional cost can be ascribed to higher oil prices, but there is no doubt that the post-1973 global inflation was caused to a large extent by oil price increases. And hence, row 6 of Table VI (which

TABLE VI

SOME MACROECONOMIC IMPLICATIONS OF HIGHER OIL PRICES FOR BANGLADESH, 1973/74 TO 1976/77

(value in thousand US dollars)

Items	1973/74 over 1972/73	1974/75 over 1972/73	1975/76 over 1972/73	1976/77 over 1972/73
1. Additional cost of oil imports due to price increase	39,716	122,719	104,904	121,880
2. Additional cost of other imports* due to price increases	108,661	427,807	411,069	181,481
3. Additional earnings from exports* due to price increases	14,135	77,347	160,421	190,143
4. GDP at market prices	6,237,000	6,036,875	3,836,207	3,700,000
5. (1) as % of (4)	0.64	2.03	2.73	3.29
6. (1) + (2) as % of (4)	3.53	9.12	13.45	8.12
7. (3) — (1) — (2)	—134,242	—473,179	—355,551	—113,217
8. Actual exports	371,763	382,675	380,469	412,200
9. (1) as % of (8)	10.7	32.1	27.6	29.6
10. (1) + (2) as % of (8)	59.3	143.9	135.6	73.6

Note : * The appendix contains a list of the imports and exports included here.
Source : Calculated from data provided by sources mentioned under Table V.

[7]It might also be interesting to note that during 1974/75, national income per capita also declined compared to that of 1973/74. In constant prices of 1972/73, per capita income in 1973/74 and 1974/75 were Taka 650 and 645 respectively. See [6, p. 187].

expresses the additional cost of all imports taken together as percentage of national income) can be taken as a rough measure of the extent to which the country has been made poorer by higher oil prices.

It is true, however, that the prices of exports from Bangladesh have also registered some increase during this period, and the resulting gain must have offset the loss to some extent. But the net result was considerable deficits as indicated in row 7 of Table VI.

Impacts on the Capacity to Import and the External Balance

How the country's capacity to pay for imports from exports alone was affected by the rise in oil prices can be seen from a comparison of the value of exports and the additional cost of oil imports. Row 9 of Table VI reveals that the additional cost of petroleum imports due to the price rise alone in 1974/75 was about 32 per cent of total exports that year. This indicates that only if Bangladesh had increased exports by this amount she could have maintained her capacity to pay for other imports out of export receipts ; but this did not happen.

Moreover, it is well-known that the recession in developed countries following the rise in oil prices led to a reduction in the volume of exports from many LDCs.[8] That Bangladesh is no exception to this can be seen from Table VII where we show the movement of the volume of exports of the major commodities since 1972/73. It is seen that exports of almost every commodity went down in 1974/75. The only major exceptions were hides and skins which had already reached a low in 1973/74. After the trough of 1974/75, the next two years were somewhat better with the exports of raw jute and tea rising. But the volume of both the exports declined again in 1977/78. In fact, the volume of raw jute exports could never reach the levels of 1972/73 and 1973/74. The exports of jute manufacturing and hides and skins fluctuated even after 1974/75, with the levels of the latter in 1977/78 and 1978/79 being lower than that of 1974/75.

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[8]It may be pointed out that this is only true so far as the LDC's exports to DCs are concerned. And here it may be pertinent to ask : What proportion of Bangladesh's exports goes to the DCs ? An examination of the destination of Bangladesh's export reveals that a major portion of it goes to the DCs. In 1976/77 for example, 78 per cent of the total value of her exports went to countries in North America, Europe (including East Europe and U.S.S.R.), Australia and New Zealand. (Data from [17]).

The result has been a reduction in her capacity to pay for imports and a deterioration in her external balance situation (see Table VIII). It should be mentioned here that the decline in the trade deficit after 1974/75 (as Table VIII shows) is more apparent than real, and has been caused by the devalution of 1975. The Taka value of the deficit in fact shows a continuous upward trend with the exception of 1976/77.

It must be noted here that the commodity terms of trade used in our earlier analysis does not allow for shifts in the foreign offer curve. But we have just seen that after 1973/74 exports from Bangladesh came under pressure from an inward shift in the foreign offer curve. The consequences of such a shift can be analysed by using the income terms of trade which measures a country's import capacity in terms of exports alone. The income terms of trade as a measure of import capacity should not, however, be confused with total import capacity, which depends on foreign aid and loans, net factor earnings, etc.

TABLE VII

EXPORTS FROM BANGLADESH, 1972/73 to 1978/79

Commodities	Unit	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79
Raw jute	'000' tons	464	461	307	407	454	306	361
Jute manufg.	'000' tons	433	438	379	439	392	522	457
Tea	'000' lbs.	58,245	48,800	44,300	51,500	64,452	55,807	54,836
Fish	cwt.	n.a.	136,971	64,214	75,461	69,998	n.a.	n.a.
Hides and skins	'000' tons	11	7	11	13	11	9	10

Note : n.a. denotes not available.

Surces : [5], 1976/77 and [3; 4].

In order to examine the extent to which the country's capacity to import has been affected by the rise in prices, especially of oil and oil products, we have calculated three sets of income terms of trade (see Table IX). The difference between these three sets is the same as in the case of commodity terms of trade (Table V). A comparison between the commodity and income terms of trade reveals that the deterioration in the latter has been much more severe upto 1976/77. This indicates

Table VIII

BALANCE OF TRADE OF BANGLADESH, 1972/73 to 1978/79

(value in thousand US dollars)

Year	Surplus/Deficit
1972/73	+ 55,875
1973/74	— 554,624
1974/75	— 963,250
1975/76	— 631,103
1976/77	— 472,451
1977/78	— 712,129
1978/79	— 780,322

Note: Official exchange rates used for the conversion of value figures are:
Up to 1974/75: $1 = Tk. 8.00
1975/76: $1 = Tk. 14.50
After 1975/76: $1 = Tk. 15.50

Source: [2, p. 311].

that the decline in export volumes coupled with an already deteriorating commodity terms of trade severely impaired the country's capacity to pay for imports. A comparison between sets 1 and 2 in Table IX shows the impact of higher oil prices. It is clear from this table that had the prices of POL products remained constant, the decline in income terms of trade would have been less sharps.[9] If we could show how far the shift of the demand curve in the export market was due to rising oil prices, we could demonstrate their impact on the country's capacity to import more fully. The conclusion is inescapable, however, that the decline in the volume of exports has severely affected Bangladesh's capacity of pay for the greatly increased import bill (which was again caused largely by higher oil prices and related price increases).

This in turn, can have serious implications for the flow of imports into the country. In order to examine the nature and magnitude of such imports, we have calculated the index of the volume of imports for some important consumer and intermediate goods. Table X presents these indices.

[9]After 1976/77 the income terms of trade started improving as had the commodity terms of trade—the improvement in the former being more marked. But Table IX shows that the recovery would have been more pronounced in the absence of the steep rise in the oil prices.

Data presented here indicate that in almost all cases except POL products, the flow of imports was adversely affected—although in varying degrees in various years. The case of capital goods could not be examined because of the lack of data on the quantity of such goods imported.

TABLE IX

INCOME TERMS OF TRADE OF BANGLADESH (1972/73=100)

Year	Set 1	Set 2	Set 3
1973/74	60	63	62
1974/75	46	51	49
1975/76	58	64	49
1976/77	68	78	75
1977/78	89	105	101
1978/79	95	111	107

Source : Our calculations.

TABLE X

INDEX OF THE VOLUME OF IMPORTS INTO BANGLADESH (1972/73=100)

Commodities	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79
Foodgrains	57	87	51	28	58	42
Rice	23	67	102	51	77	15
Wheat	63	90	43	25	55	46
Crude petroleum	47	112	115	141	158	142
Petroleum products	562	345	311	219	248	293
Raw cotton	44	63	57	63	48	66
Cotton yarn	173	18	8	45	90	50
Fertilizer	61	96	149	19	174	265
Cement	36	103	69	66	123	139

Source : Calculated from [11, p.87].

In the aggregate a change in the total volume of imports can be detected by comparing the total import value index with the import price index : if the volume of imports remains constant as import prices

increase, the two indices will change in the same proportion. If the former index changes less than the latter, a decline in the volume of imports is indicated. Table XI shows that the index of import values was much lower than the import price index throughout the period under investigation. We may, therefore, conclude that the volume of imports declined after 1972/73.[10]

TABLE XI

INDEX OF IMPORT VALUE AND IMPORT PRICE (1972/73=100)

Year	Index of the Value of Total Imports	Import Price Index
1973/74	1·27	164
1974/75	193	226
1975/76	174	332
1976/77	119	304
1977/78	185	269
1978/79	220	327

Source: Index of import value has been calculated from data provided by the World Bank. Report mentioned at the bottom of Table X. Import price index is taken from Table V.

It is possible to argue that increased domestic production may have reduced import requirements of the country and that the above-discussed fall in import volume may simply reflect such reduced requirement. But the decline in the volume of imports occurred even in the areas where the country depends entirely on imports. Imports of raw cotton, for example, declined substantially after 1972/73, while there was no increase in the imports of cotton yarn to offset this decline. In fact, there was a sharp fall in the imports of yarn as well after 1973/74. In some cases (e. g., foodgrains and fertilizers) domestic production increased to replace imports to some extent, but the reduction in the total volume of imports cannot be ascribed to reduced import requirements. Generally speaking, this was due to the country's shrinking capacity to pay.

[10]This conclusion is subject to the qualification that the weights used in the two indices are somewhat different, and this might have caused some difference in the movement of the two indices in Table XI.

Imports of capital goods and intermediate goods (including raw materials) were cut most drastically. In fact, there is evidence that after 1972/73, the manufacturing industries of Bangladesh suffered from an acute shortage of raw materials.[11] Consequently, the rates of operation of industries declined considerably.[12]

IV. SUMMARY AND CONCLUSIONS

In this paper we tried to examine the impact of the steep rise in oil prices that has taken place since 1973 on the terms of trade, balance of trade and the capacity to pay for imports out of export receipts of Bangladesh.

We have also attempted to see the additional costs the country had to incur because of higher oil prices in relation to her gross domestic products and exports. The results presented in the paper indicate that the country would have faced a deteriorating terms of trade even in the absense of such a rise in oil prices, but this phenomenon has made things much worse for her. Not only her terms of trade deteriorated severely, her major exports suffered a setback and the reduced capacity to pay for imports led to a shrinking of the volume of crucial imports. The additional cost of imports due to higher oil prices was also quite substantial in relation to the country's GDP, its growth, and exports. Thus the rise in oil prices seems to have made substantial contributions to the country's impoverishment during the seventies.

One may, of course, argue that for Bangladesh increases in the prices of other commodities (like foodgrains, fertilizers, machinery, etc.) were much more important than the rise in the price of oil. But we have argued that the post-1973 global inflation was caused to a large extent by the increase in the price of oil. Thus although the rise in the price of oil was not the only shock inflicted on the economy of Bangladesh the 'total' effect of this shock was quite far reaching and severe. This should not, therefore, be dismissed as a second-order problem for Bangladesh.

How can the adverse consequences of the increase in oil prices be minimized ? One way would be to reduce imports ; and since Bangladesh does not have any domestic supply of oil the only way to do it would be to

[11]See [7].

[12]See [9].

reduce the consumption of oil. The major users of oil in Bangladesh are the household, the transport and the manufacturing sectors; and the necessary economy in oil consumption has to be achieved mainly in these sectors. Fuel for cooking and lighting are the important uses of oil in the household sector; and more economical alternatives in these uses need to be found.[13] In the transport sector, simultaneously with the search for alternative fuel, attempts should be made to achieve economy in the use of oil.[14] In the manufacturing sector also careful investigation should be made into the present pattern of using oil and the possibilities of substitution.

Clearly, a lot more need to be known before one can make useful policy recommendations. It might be useful to examine how the different sectors using oil adjusted to the changed circumstances. Even in case no conscious adjustment was made, an analysis of the impact of the phenomenon on the cost structure of the using sectors could be quite interesting. The economics of using alternatives in various sectors need to be carefully worked out. Finally, the role of pricing and other policies in achieving substitution and economy in the use of oil should be explored. These can be subject matters for future research in the area.

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[13]Here one should avoid the danger of naively suggesting a substitution of oil by natural gas which is available domestically, for the latter can have many more profitable uses and the economics of oil-gas substitution should be carefully worked out for the household sector.

[14]One way, for example, of doing the latter would be to develop and encourage the use of mass transport rather than private transport.

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Appendix

DATA AND METHODOLOGY FOR CALCULATING TERMS OF TRADE

Sources of Data and Commodity Coverage

It should be noted at the outset that we have used unit value indices as price indices for both exports and imports. This is of course a common practice because of the obvious difficulty involved in obtaining price figures for individual imported items.

The period which has been covered in the present study is from 1972/73 to 1978/79. The most serious problem was posed by the difficulties in obtaining detailed and reliable trade statistics for this period ; and this is especially true of imports. The Foreign Trade Wing of the Bureau of Statistics of the Government of Bangladesh which is in charge of compiling data in this area faced many problems in doing so after the Liberation of the country. Hence, we had to look for alternative sources for import data. Planning Commission of the Government of Bangladesh and the World Bank Resident Mission in Dhaka were able to provide us with necessary data for the major import items. We did our own calculations of the import price indices on the basis of these items.

Relevant data on exports were available in the various issues of Advance Release supplied by the Foreign Trade Wing of the Bureau of Statistics. We calculated the unit value of exports by using this data.

Unfortunately, none of the sources mentioned above, provide a complete coverage of all imports and exports on the basis of Standard Trade Classification. So, we had to do our calculations on the basis of the major items of exports and imports. The import price index is based on the following commodities : (i) rice ; (ii) wheat ; (iii) edible oils ; (iv) oil seeds ; (v) raw cotton ; (vi) cotton yarn ; (vii) fertilizers ; (viii) cement ; (ix) crude petroleum ; and (x) petroleum products. The items mentioned above constitute over 60 per cent of the total imports of Bangladesh. The items included in the export price index are : (i) raw jute ; (ii) jute manufactures ; (iii) hides and skins ; (iv) leather ; and (v) tea. These together account for nearly 95 per cent of the total exports of Bangladesh.

Methodology

In this study, we calculated both the commodity terms of trade and the income terms of trade. The formula for the commodity terms of trade (T_n) is given by

$$T_n = \frac{P_x}{P_m} .100$$

where P_x = export price index, and

P_m = import price index.

A decline in T_n would obviously mean an adverse movement in the country's terms of trade.

Now the question is, how do we calculate P_x and P_m ? The first problem arises from the various ways of calculating these indices (for example, Laspeyre's, Paasche's or Fisher's Ideal index). And it is difficult to establish the superiority of either of the first two indices over the other. The choice between the first two would of course depend on the type of question we are asking. While the Laspeyre index is a base year weighted index, the Paasche index uses current year quantities as weights. Unless there are significant structural changes, the two indices should be fairly close to one another. Moreover, for the present study it seemed more appropriate to investigate how the prices of a given bundle of goods moved compared to the base year. That is why, we have used the Laspeyre's price index. The relevant index for imports and exports are respectively :

$$P_m = \frac{p_{ml} \quad q_{mo}}{p_{mo} \quad q_{mo}} .100$$

$$P_x = \frac{p_{xl} \quad q_{xo}}{p_{xo} \quad q_{xo}} .100$$

where p_m and p_x for the i-th commodity are calculated as

$$p_i = \frac{V_i}{qi}$$

where V_i is the value of import or export of the i-th commodity and q_i is

the volume of export or import of the i-th commodity.

The income terms of trade (T_y) has been calculated as :

$$T_y = \frac{P_x}{P_m} . Q_x . 100$$

where Q_x is the index of the volume of exports. Here the index of the value of exports is deflated by the import price index. The resulting index thus clearly becomes a measure of import capacity. It shows the purchasing power of exports. From the formula of income terms of trade, it can be seen that movements of the commodity terms of trade and income terms of trade can take place quite independently of each other. The income terms of trade may decline despite a rise in the commodity terms of trade if the fall in export volume more than offsets the rise in the prices of exports relative to imports.

Foreign Dependence, Domestic Policies, and Economic Development in a Poor Labour Surplus Economy

by

M. G. QUIBRIA*

The present paper argues that though foreign resources play an important part in initiating and sustaining development, their importance has been over-stressed in the so-called two-gap models of foreign aid, as expounded by Chenery and Strout, Mckinnon, and others. In this paper, it is shown that by designing appropriate policies on the domestic front, the critical importance of foreign resources can be relaxed to a significant extent. In particular, the present paper emphasizes the role of wage policy and the need for human resource mobilization for a labour-surplus economy. The paper also sketches out the paths of dual gaps for a labour-surplus economy and shows that policies ensuring appropriate wage growth can affect both types of gaps to a significant degree.

I. INTRODUCTION

Recent years saw the development of a substantial body of literature emphasizing the critical importance of foreign resources in initiating and sustaining the process of growth in less-developed countries. This literature—popularly known as the two-gap models[1]—no doubt correctly underscores the importance of foreign resources in the initial stage of development. But it is often alleged that these two-gap models, as enunciated by Chenery and Strout [2], Mckinnon [8] and others, tend to overstress

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[1]For a survey of the two-gap literature, see Quibria [11].

unemployment. Section III reports some numerical results (derived with the data taken from the economy of Bangladesh) to illustrate the qualitative results of the model. Section IV presents a summary of the important conclusions and adds some remarks on further work.

II. THE MODEL

We shall assume that the aggregate production function of the economy can be represented by a neoclassical constant-returns-to-scale production function. This assumption is in contrast with that of the two-gap type models where a fixed-coefficient production function is generally postulated. The assumption of a fixed-coefficient production function, though may be correct at an individual industry level, is patently unrealistic at least in the aggregate economy level. Even if the individual industries in the economy exhibit fixed-coefficient type production functions, the aggregate production can be made a smooth function of labour and capital by varying the output-mix in the final production vector. With the above consideration in mind, we posit :

$$Y = A.F(K,L) \qquad \ldots \quad (1)$$

where, as usual Y denotes the total output, L labour, K capital and A the scale factor. The growth of A represents a measure of Hicks-neutral technical progress. However, our analysis will remain invariant even if we posit Harrod-neutral technical progress in production. Note that the advantage of adopting a flexible constant-returns production function is that it can incorporate a wide variety of production functions including the fixed-coefficient case—which is indeed a constant-elasticity-of-substitution (CES) production fuction with the elasticity of substitution equal to zero.

We assume that the economy is a labour-surplus one with a given wage rate W. This real wage increases over time at a constant rate w. Thus, the wage rate equation can be represented by the following :

$$W = W_0 \, . \exp[\, wt \,] \qquad \ldots \quad (2)$$

where W is the wage rate at time t and W_0 the initial wage rate. Similarly, we assume that the population of the country increases at a rate p. Then the population growth equation can be represented by :

$$P = P_0 \, .\exp[\, pt \,] \qquad \ldots \quad (3)$$

where P is the population at time t and P_O is the initial population. Of the total population, u proportion participates in the labour force.[8] Thus, the total labour supply at any time can be represented by :

$$N \equiv u \, . \, P = u \, . \, P_o e^{pt} = N_o \, . \, e^{pt} \qquad \ldots \quad (4)$$

where N is the labour supply at time t and N_O $(=up_O)$ is the initial labour supply.

The rate of labour employment in the economy is assumed to be determined by the equality of marginal productivity of labour with the wage rate.[9] Thus, the labour demand function is implicitly given by the following equation :

$$A\,(\,\delta F/\delta L\,) = W \qquad \ldots \quad (5)$$

For the sake of simplicity, we shall assume that saving is a linear, proportional function of income.[10] Further, we shall assume that all savings are invested. Thus,

$$I^d = S = s \, .Y \qquad \ldots \quad (6)$$

where I^d is investment from domestic sources, S is aggregate savings and Y is aggregate income.

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[8]Note that the assumption of a fixed labour-force participation ratio (u) incorporated in the present analysis is a simplifying one. This apparently mechanical assumption, often adopted in growth-theoretic analysis, has the implication that a certain percentage of the total population acquire at each point in time certain characteristics which qualify them to be a part of the labour force. This simplification (which is in accord with the practices of many national censuses and also adopted in many demographic studies) is quite useful at least in identifying the potential labour force. However, one could have posited an alternative specification by defining the labour-force participation ratio as a monotonically increasing function of the real wage level. Such a change in the specification, which in some respects may have been more helpful in identifying the reservoir of actual labour surplus persisting in the economy, would not have affected the qualitative nature of our results. However, it would have complicated the analysis to a considerable extent.

[9]It is often argued that in a LDC, where income sharing is an important fact of life, labour demand is determined by the equality of average productivity of labour with the wage rate. Such a change in specification will not, however, affect our results.

[10]We could have replaced the present simplifying assumption of a proportional savings function with a non-linear convex function of income. However, we can report that so far as qualitative results are concerned, such a change does not affect them in any significant way. From another point of view, the savings function could also have been generalized. It is often argued that saving is not only a function of income but also of net inflow of foreign resources. It is alleged that the latter affects savings in a negative way, (See, for example, Rahman [13]). However, the evidence in this area is still too inconclusive to be incorporated in the model, and in any case, the incorporation of the net inflow of foreign resource as a variable in the savings function would not affect the conclusions of this paper.

Now, from equation (1), one can easily deduce the following relationship :

$$\hat{Y} = \hat{A} + \varepsilon\hat{L} + (1 - \varepsilon)\hat{K} \quad \dots (7)$$

where $\hat{K} = d(\ln K)/dt$, $\hat{A} = d(\ln A)/dt$ etc., and ε is the labour's share of output. Note that $\hat{A}$ is a measure of technical progress that obtains in the economy. Assume that the economy is pursuing a target of increasing the per capita income at a rate r. To achieve this goal, the aggregate income must increase at a rate of (r+p), where p is the rate of population growth. Now denoting $\hat{A} = a$, we can write equation (7) in rearranged form as:

$$\hat{K} = \{(r + p - a) - \varepsilon\hat{L}\} / (1 - \varepsilon) \quad \dots (7')$$

Now, differentiating (5) logarithmically, one can derive after a bit of messy calculations :

$$(1 - \varepsilon)(\hat{K} - \hat{L}) = (w - a)\sigma \quad \dots (8)$$

where σ is the elasticity of substitution in production. Rearranging, one can derive :

$$\hat{L} = \hat{K} - [(w - a)\sigma / (1 - \varepsilon)] \quad \dots (8')$$

Now substituting the value of $\hat{K}$ from (7′) into (8′) gives :

$$\hat{L} = (r + p) - \sigma w - (1 - \sigma)a \quad \dots (8'')$$

The above expression shows that labour demand will increase with an increase in the target rate of growth and also with an increase in the rate of population growth, but it decreases with an increase in the wage rate, provided $\sigma > 0$. However, the impact of technical progress on labour demand is ambiguous — labour demand increases with technical progress if $\sigma > 1$ and decreases with technical progress if $\sigma < 1$.

Again substituting the expression for $\hat{L}$ in (8″) into (7′), one can obtain the expression for $\hat{K}$, which after suitable rearrangement, becomes :

$$\hat{K} = (r+p) - h \quad \dots (7'')$$

where $h \equiv [\, a - \varepsilon \{ a(1-\sigma) + w\sigma \}]/(1-\varepsilon)$. Note that h depends on ε, labour's share of output, and σ, the elasticity-of-substitution parameter ; and both of them are time dependent. Therefore, h is a function of time t.

Equation (7″) represents the required rate of growth of K needed to sustain a target rate of growth of per capita income r. Relation (7″) is a differential equation which can be solved to find the growth path for capital stock as needed to sustain a target growth rate.[11] Elementary manipulations will yield the following growth path for K :

$$K = K_o . \exp\left[\int_o^t \left(r + p - h \right) dt\right] \qquad \text{... (9)}$$

where K_o is the initial capital stock.

Now from (9), we can find the required rate of investment which is given as follows :

$$I = K_o\,(r+p-h)\,\exp\left[\int_o^t \left(r+p-h \right) dt\right] \qquad \text{... (10)}$$

$$\text{or} \quad I = K_o \; \exp\left[\int_o^t \left(r+p-h \right) dt\right],$$

$$\text{where} \quad I_o = K_o\,(r+p-h) \qquad \text{... (10')}$$

Savings-Investment Gap

The savings-investment gap is defined as the difference between the required total investment as needed to sustain a target growth rate and the supply of domestic resources for investment. Thus,

$$F^s = I_o \exp\left[\int_o^t \left(r+p-h \right) dt\right] - S.\,Y_o \exp\left[\left(r+p \right) t\right]$$

$$\text{or,} \quad F^s = I_o \exp\left[\int_o^t \left(r+p-h \right) dt\right] - I_o^d \,.\, \exp\left[\left(r+p \right) t\right] \qquad \text{... (11)}$$

where $I_o^d \equiv S.Y_o$.

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[11]One can compare the rate of growth of capital and that of output. One can see $\hat{Y} > \hat{K}$ as long as $h > o$. For $h > o$, a sufficient condition is that the rate of technological progress (a) should be faster than the rate of growth of wage (w). We shall see in a moment that this condition must continue to hold if foreign dependence is to be eventually eliminated.

A measure of foreign dependence is provided by the ratio of savings gap to total investment (F^S/I).[12] We henceforth call this ratio β^1 or dependence of first type.[13] Now dividing both sides of (11) by

$I_0 \exp\left[\int_0^t \left(r+p-h\right)dt\right]$, we get :

$$\beta^1 = 1-(1-\beta_0^1)\exp\left[\int_0^t h dt\right] \qquad \ldots (12)$$

where $\beta_0^1 = F_0^s/I_0$ where F_0^s is the initial F^s with which the economy starts.

Now for β^1 to decline with time and reach a nonpositive value, it is necessary that

$$d\beta^1/dt = -(1-\beta_0^1)\, h \exp\left[\int_0^t h dt\right] < 0 \qquad \ldots (12')$$

Since $0 < \beta_0^1 < 1$ (which excludes zero or total dependence), equation (12′) implies that for foreign dependence to decline monotonically (and to reach a level of eventual independence), it is necessary and sufficient that $h > 0$.

This condition, that is $h > 0$, reduces to the following under various simplifying assumptions about the elasticity of substitution in production :

(i) If $\sigma \to 0$, then $h > 0$ implies that $a > 0$;

(ii) If $\sigma = 1$, then $h > 0$ implies that $(a-w\varepsilon)/(1-\varepsilon) > 0$;

(iii) If $\sigma \to \infty$, then $h > 0$ implies that $a > w$.

In general, as long as there is some substitutability in production, the sufficient condition for dependence of first type to decline to zero is that the rate of technical progress is as high as the rate of growth of the wage rate.

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[12]This is very similar to the concept of dependence ratio introduced by Wasow. But in the present paper, we introduce and distinguish between two concepts of dependence ratio, which we call dependence of first-and second-type. As it should be evident, these two concepts are very closely related to the savings-investment gap and the foreign-exchange gap, respectively.

[13]In this exercise, we are abstracting from the problem of debt-servicing—assuming implicitly that all loans are interest free. For an analysis of the debt problem in the context of two-gap models or a variant of it, see Kapur [6] or Quibria [12].

The termination date for dependence of first type can be found by equating the RHS of (12) to zero. Then the equation (12′) can be manipulated to derive a very simple expression for the termination date, t* :

$$\int_{o}^{t} h \, dt = (\ln I_o - \ln I_o^d). \qquad \ldots (13)$$

Though the above expression is a very compact one, one understands that t* is determined by the parameters of the system, namely, r, p, w, a, s, σ and Y_O. In the following, Table I shows the sensitivity of the termination date, t*, to changes in the values of these parameters.

TABLE I

SENSITIVITY OF THE TERMINATION DATE FOR FOREIGN-DEPENDENCE OF FIRST-TYPE TO CHANGES IN DIFFERENT PARAMETERS

	δr	δp	δs	δy_o	δa	δw	$\delta \sigma$
δt^* :	+	+	—	—	+,o*	—,o,+**	

* For $\sigma >, \; = \; o$.

** For $a\text{-}w >, \; = < o$.

The above gives us the following set of conclusions : With an increase in the growth rates of target income, population and wage, the termination date of dependence of first type gets delayed. The above analysis points to the importance of checking population growth and curbing wages for reasons of reducing foreign dependence. Similarly, an increase in the rate of technical progress or the rate of savings can decrease the time required for eliminating capital import. The impact of a higher elasticity of substitution in production on the time horizon is dependent on the balance between the growth of wage and the rate of technological progress. Given that the rate of technological progress is higher than the growth of the wage rate, a higher elasticity of substitution will reduce the total time required for elimination of (foreign) dependence of first type. However, if the wage rate is increasing faster than the technical progress rate, then a higher elasticity of substitution in production will not help in reducing the length of dependence period.

Foreign Exchange Gap

The foreign-exchange gap of an economy at any time t can be defined as the difference between import requirements and export earnings. Of the

total investment requirements defined by (10′), assume a proportion m_i is imported from abroad. We are making here an extreme assumption—that is, there is no substitutability between domestic and foreign capital—in the spirit of two-gap type models. As Michalopulous [7] has shown, such an assumption is likely to be misleading in the context of most developing countries. However, even with these types of extremely rigid assumptions, we should be able to show in the following that domestic policies—particularly a well-designed wage policy—can be of great help in reducing foreign dependence. The next import item is consumption import. We shall assume a simplified relationship with respect to consumption : Of the total income Y, (1-s)Y is devoted to consumption, of which m'_c proportion is imported from abroad. Further assume that intermediate imports are a fixed proportion m_r of the total output Y. Thus the total import requirements of the economy can be expressed as

$$M = m_i I + m'_c \ (1-s)Y + m_r Y \qquad \text{... (14)}$$

$$\text{or,} \quad M = m_i I + m_c Y \quad \text{where} \quad m_c \equiv m'_c \ (1-s) + m_r \qquad \text{... (14')}$$

The export earnings of the economy, following Mckinnon [8] are assumed to obey the following pattern :

$$E = \lambda Y$$

where λ denotes the average propensity to export. Then the foreign-exchange gap of the economy is defined as follows :

$$F^e = m_i I + m_c Y - \lambda Y \qquad \text{... (15)}$$

which, in other ways, can be expressed as :

$$F^e = M_o^i \ \exp \left[\int_o^t (r+p-h)dt \ M_o^c \exp \ (r+p)t \right] - E_o \exp[(r+p)t] \qquad \text{... (15')}$$

where $M_o^i = m_i I_o$, $M_o^c = m_c Y_c$, and $E_o = \lambda Y_o$. Now we define foreign dependence of second type (β^2) as the ratio of the foreign-exchange gap to total import requirements. Thus, dividing both sides of equation (15′) by M, total import requirements, we get :

$$\beta^2 = 1 - \{E_O.\exp[(r+p)t]/M\} \qquad \text{... (16)}$$

The time derivative of β^2 yields :

$$d\beta^2/dt = -\{M(r+p)E_0 \exp[(r+p)t] - E_0 \exp[(r+p)t] \ (\delta M/\delta t)\}/M^2 \qquad \text{... (16')}$$

On simplification,

$$d\beta^2/dt = -(E_O \exp [(r+p)t] /M^2) \ \{M(r+p)-(\delta M/\delta t)\}$$

Now we can easily see that $(d\beta^2/dt)$ is negative if and only if the following is true :

$$(dM/dt) - M(r+p) < 0$$

On substitution of the values of M and $(\delta M/\delta t)$ and on further simplification, the above condition reduces to :

$$- M_o^i.h.\exp\left[\int_o^t (r+p-h)\, dt\right] < 0$$

The above expression is negative if and only if $h > o$. Thus the condition for decline of both β^1, β^2 are identical i. e., $h > o$. Recall that h is positive if and only if the rate of technical progress is at least as fast as the wage growth rate. The above condition points to the fact that to achieve both types of foreign-independence, it is necessary that domestic parameters be 'right' ; otherwise, the country will remain ever dependent on foreign resources.

The termination date for dependence of second type (if it exists) is defined by the following equation :

$$M_o^i. \exp\left[\int_o^t (r+p-h)\ dt\right] + M_o^c \exp\ [(r+p)t] - E_o \exp\ [(r+p)t] = 0$$

The above equation can be solved explicitly for the termination date, $\hat{t}$, which is :

$$\int_o^{\hat{t}} h dt = \ln\ M_o^i - \ln(E_O - M_o^c) \qquad \text{... (17)}$$

This termination date $\hat{t}$ is determined by both domestic and external parameters of the system.[14] By messy mathematical manipulations, one can arrive at the following set of results, as presented in Table II.

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[14]For the existence of a positive, finite $\hat{t}$, the termination date for dependence of second type, it is necessary that $E_o - M_o^c > o$, implying that the country can at least finance its current accounts imports with its export earnings. If that condition does not hold, one can easily see from eq. (17), that F^e will never reduce itself to zero.

TABLE II

SENSITIVITY OF THE TERMINATION DATE FOR FOREIGN-DEPENDENCE OF SECOND-TYPE TO CHANGES IN DIFFERENT PARAMETERS

	δr	δp	δs	δw	δa	$\delta \sigma$	$\delta \lambda$	m_i
$\delta \hat{t}$	+	+	—	+,0*	—	—, 0, +**	—	+

* For $\sigma >, = 0$.

** For a-w $>, =, < 0$

The above analysis shows that an increase in either the target rate of growth or the population rate of growth will increase the length of dependence. Austerity efforts like increasing the savings rate or decreasing the wage growth are likely to decrease the dependency length. Note that this is in contrast with the moral of two-gap type models where domestic policy efforts at increasing the savings rate or containing the wage-growth are totally useless—they cannot affect the foreign-exchange gap. Similarly, technical progress—either in the form of new machines or better education—is not completely useless : it has the effect of reducing the dependency length. External economic policies directed at increasing exports or substituting imports are also likely to pay dividends in the form of shortening the termination date of foreign dependence. The above analysis clearly shows that both domestic and external policies are useful in effecting foreign dependence in any real world economy as contrast to the rigid, make-believe world of two-gap models.

Next we investigate briefly the interrelationship between the savings-investment gap and foreign-exchange gap. We will show that if a country starts with a dominant savings-investment gap it will end up with a dominant foreign-exchange gap. Though Chenery and Strout [2] were the first to have suggested the proposition, they stopped short of proving it.[15] Now using equations (11) and (15), one can write :

$$F^s - F^e = (1 - m_i) I_o \exp\left[\int_o^t (r+p-h)\,dt\right] - (s+m_c-\lambda) Y_o \exp[(r+p)t] \quad \text{.... (18)}$$

[15]Actually the Chenery-Strout hypothesis of three phase growth and the consequent switch from a dominant savings-investment gap position to a dominant foreign-exchange gap position is based not really on the internal logical structure of the model, but on the intuitive view of the process of development over a long run historical perspective.

Equating the RHS of (18) to zero, we can derive t^{**} which defines the time when F^s equals F^e. The time t^{**}, one can easily verify on simplification of eq (18), is implicitly defined by :

$$\exp\left[\int_o^t h\,dt\right] = (1\ m_i)\,I_o/\,(s + m_c - \lambda)\,Y_o \qquad \ldots (19)$$

The RHS of (19) is a constant whereas the LHS is an increasing function of t. Thus if at t^{**}, the LHS is equal to the RHS, then for $t< t^{**}$, the RHS is greater than the LHS and for $t<t^{**}$, the RHS is less than the LHS. Therefore, if the country starts with $F^s>F^e$, it will end up with $F^e>F^s$.

Profile of Unemployment

The above model can also give us some insight about the growth of unemployment in a labour-surplus economy and show how the various parameters of the system condition its growth. The amount of unemployment (V) prevailing in the economy at any time t can found by utilizing equations (4) and (8'') :

$$V(t) = N - L = N_o.\ \exp[pt] - L_o.\exp\left[\int_o^t \theta dt\right] \qquad \ldots (20)$$

where $\theta = (r+p) - \sigma w - (1-\sigma)a$. Now dividing both sides of (20) by N, denoting $\mu\ (=V/N)$ as the rate of unemployment, we can derive :

$$\mu(t) = 1 - (1-\mu_o)\ \exp\left[\int_o^t (\theta - p)\,dt\right] \qquad \ldots (21)$$

The condition required for the unemployment rate to decline with time is that the time derivative of μ be negative.

Thus,

$$d\mu/dt = (1-\mu_o)\ (\theta - p)\ \exp\left[\int_o^t (\theta - p)dt\right] < 0 \qquad \ldots (22)$$

if and only if $\theta - p > 0$. In other words, it implies that $r > \sigma w + (1-\sigma)a$. When $\sigma \rightarrow 0$, the above condition reduces to $r>a$. That is, the growth target should be greater than the technical progress rate. If $\sigma = 1$, the condition reduces to $r>w$. That is, the rate of growth of output be

greater than the growth in the wage rate. If $0<\sigma<1$, then the above condition states that the target growth for output be greater than the weighted average of the rate of growth of wage and the technical progress rate.

As we did in the previous instances, we can find in a similar fashion, the time required for achieving full employment. Equating the RHS of (21) to zero, we can find the required time, t′, which, after some elementary manipulations, reduces to the following simple expression :

$$\exp\left[\int_{o}^{t}(\theta-p)\ dt\right] = \ln N_o - \ln L_o \qquad \text{... (23)}$$

One can, through elaborate but elementary mathematical manipulations, find the sensitivity of t′ with respect to r, u, w, σ, .P_O, a, Y_O (see Table III).

TABLE III

SENSITIVITY OF FULL-EMPLOYMENT TIME TO CHANGES IN DIFFERENT PARAMETERS

	δr	δu	δw	δp_o	δa	$\delta\sigma$
$\delta t'$	—	+	+, o*	+	+, o, —**	+, o, —***

* For $\sigma >, = o$.

** For $1-\sigma >, =, < o$.

*** For $w-a >, =, < o$.

Thus, we see that the time required to achieve full-employment will decrease as the country pursues a higher target growth rate, but the time will increase as the wage-growth rate increases. Similarly, if the labour force participation-ratio increases or if the country has a larger population base to start with, it will take more time to achieve the full-employment goal. Interestingly enough, the effect of technological change on the time to achieve full-employment is rather ambiguous, being dependent on the elasticity of substitution parameter. On the other hand, how the elasticity parameter affects the full-employment time depends on whether the wage rate is increasing at a faster or a slower rate than technological progress. Particularly, if the wage rate grows at a slower rate than the technological progress rate, then a higher elasticity of substitution in production decreases the full-employment time.

III. SOME NUMERICAL RESULTS

In this section, we shall illustrate our results with some numerical values taken from a least developed country, Bangladesh. Most of the data for this exercise are taken from the government sources of Bangladesh.[16] However, one should make it clear at the outset that the purpose of this exercise is not to suggest any serious policy guidance, but to illustrate the results derived earlier and to test their sensitivity to changes in the values of various parameters.

Let us posit the following values for the parameters and initial conditions :

$r = .02$ $p = .028$ $w = .02$

$u = .55$ $s = .07$ $a = .015$

$\varepsilon = .65$ $\sigma = 1$ $I_o^d / I_o = .55$

Thus : $\hat{Y} = r+p = .02+.028 = .048,\ h = a - w\varepsilon/(1-\varepsilon) = \cdot 0057,$

$\hat{K} = (r+p-n) = .0423, \quad \hat{L} = \hat{Y} - \hat{W} = \cdot 028$

The time required to eliminate the savings-investment gap is given by :

$$t^* = (\ln I_o - \ln I_o^d) / h = 121$$

TABLE IV

SENSITIVITY OF THE TERMINATION DATE FOR FOREIGN-DEPENDENCE OF FIRST-TYPE TO CHANGES IN WAGE AND TECHNICAL PROGRESS PARAMETERS

W \ a	·a = ·015	a = .010	a = .005
W = .020	121.67	∝	∝
W = .015	46.21	97.04	∝
W = .005	20.65	35.94	138.63
W = .001	16.90	25.89	55.77
W = .000	16.17	24.60	48.52

[16]The data on technological progress is not available for Bangladesh or for any comparable country. It is based on a best-hope assumption. The basis of the assumption was provided by the work of Arrow *et al.* [1].

Given the above numerical values of the parameters, to sustain a growth of output at a rate of 4.8 per cent, it requires that capital stock should grow at a rate of 4.23 per cent and employment at a rate of 2.8 per cent. The time required for the elimination of savings-investment gap is about 121 years. Table IV shows the sensitivity of the termination date to changes in wage and technical progress parameter.

So far as the dependence of second type is concerned, we also experimented with the import and export parameters of the country. We can report that with the given set of parameters the country has very little hope of ever achieving independence from the foreign-exchange constraint. The numerical calculations indicate that the country will have to alter its trade parameters radically either through vigorous export expansions or through comprehensive import substitution—if it is ever to achieve independence from the foreign-exchange constraint. This finding—though very pessimistic—seems to be shared by many.

Assuming further that $L_O/N_O = .60$, in addition to the above parameters, one can calculate the full-employment time for various combinations of w and σ.

TABLE V

SENSITIVITY OF THE FULL-EMPLOYMENT TIME TO WAGE GROWTH AND ELASTICITY OF SUBSTITUTION IN PRODUCTION.

W \ σ	$\sigma = 00$	$\sigma = 1$	$\sigma = 2$
W=.02	102.2	∞	∞
W=.05	102.2	102.20	∞
W=.005	102.2	34.10	20.50
W=.001	102.2	26.88	16.06
W=00	102.2	25.60	14.60

Note that if $\sigma = o$, the full employment time does not get affected by variations in wage parameters (in fact, it is then determined by other parameters of the system). Given a particular value of the elasticity of substitution in

production, the higher the wage growth rate, the greater the time required for achieving full employment. As the elasticity increases, with the wage rate remaining the same, the full-employment time usually gets shortened.

IV. CONCLUDING REMARKS

In section II, we spelled out a simple aggregative model of growth which endogenously determines the time profiles of foreign dependence (we introduced two concepts of foreign dependence) of a labour-surplus economy. The main contribution of this paper is that it brings into the open the relative importance of various parameters—domestic and trade—in shaping of these time profiles along with their associated properties. It also focuses on the order of magnitudes the various parameters must possess in order for both types of foreign dependence to be eventually eliminated.

In the model, it is assumed that the technological conditions of the economy can be summarized by a constant-returns production function defined in terms of capital and labour. The objective of the economy is to achieve a target rate of growth of per capita income. The population of the country is growing at an exogeneously given rate. The growth rate of real wage is also exogeneously determined. Domestic savings follow a postulated path : it is proportionate to aggregate income. On the trade side, exports are assumed to be linearly related to income. Imports are broadly divided into two components : capital and non-capital. Capital imports are some fixed proportion of total investment while non-capital imports are linearly related to income. With the above set of simplified assumptions, we arrive at, among others, the following set of conclusions :

For foreign dependence—both types—to decline with time, a sufficient condition is that the rate of technological progress is greater than the rate of growth of the wage rate, provided the elasticity of substitution in production is positive. The termination date for foreign (resource) dependence is influenced by the parameters of the model as follows : As the growth rate of income or that of population or of wage increases, the termination date gets delayed. On the other hand, a higher propensity to save or a higher initial income or a higher technical progress rate shortens the termination period. The effect of elasticity of substitution on the termination period depends on the relative growth of the wage rate and the technical progress parameter. If the technical progress rate is higher than the rate of wage growth, an increase in the value of the elasticity of substitution parameter decreases the termination period.

On the other hand, if the technical progress rate is lower than the rate of wage growth, an increase in the value of the elasticity of substitution parameter increases the termination period. The above results hold for both types of dependence.

The results can be better appreciated if we understand the intuition behind the working of the model which could be stated quite simply : The starting point of the model, as it is mentioned earlier, is a constant-returns-to-scale neoclassical production function. This general specification of the production function implies that the output elasticities as well as the elasticity of substitution depend on the vector of inputs. The analysis then proceeds by assuming as exogenous real growth of the wage rate and of output ; the marginal productivity of labour condition allows us to derive labour demand which residually determines capital demand and investment. On the other hand, the output, through the savings function, allows us to determine savings and thus available funds for investment. Obviously, the available savings and the required savings do not necessarily match. Then the question is how to modify the level of funds required in order to close the gap. The flexibility introduced at the level of production function allows a variation of the investment demand via changes in the capital-labour ratio. And this can be accomplished by varying the growth of the wage level and how far this will succeed will obviously depend on the amount of flexibility available at the production function level. It should be underscored at this point that the question of foreign dependence is inextricably connected with the question of choice of (production) technique, an issue which seems to have received cursory references in the descriptive literature but have been almost totally neglected in the theoretical literature.

The foregoing analysis clearly shows the importance of policies aimed at containing the growth of real wage and mobilization of human resources. In a capital-poor, labour-surplus economy, the above results point to a particular direction in which these countries can act to reduce their foreign dependence.[17] However, we do not choose to address ourselves to the question of political feasibility of these policies in this paper.

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[17]The model also shows, contrary to the lessons of the two-gap type exercises but possibly vindicating the popular notions, that domestic policy efforts at increasing the savings rate, decreasing the population growth or imparting better education and training to the labour force etc. are not totally useless : they can be useful instruments for promoting growth and reducing foreign dependence.

As we have already mentioned, the above model is a very simple one (it abstracts from many important aspects of reality). We think the model content can be greatly improved, and more insights can be gained, if we can incorporate the following :

In the present exercise, we have confined ourselves to one sector only. One can profitably extend it to a two-sector model in terms of 'food' and 'manufacturing'. Beside bestowing analytical richness to the model, such a distinction will enable one to explore policy issues arising out of output-mix. More specifically, one should be able to show that through a manipulation of domestic policies (such as fiscal policy, e. g., by taxes and subsidies), one can reduce the extent of foreign dependence of the country.

Finally, in the present exercise we incorporated a very simple set of export and import functions which were assumed to be insensitive to prices. Incorporation of price-sensitiveness will no doubt add descriptive richness to the model. But more significantly, it will enable one to explore the implications of trade policies for foreign resource requirements—as emphasized by Nelson [9]—along with domestic policies. However, such incorporations are likely to complicate the analytical tractability of the model to a considerable extent.

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Appendix

Interrelationship between foreign dependence and labour's share of output :

Integrating the first-order homogeneous differential equation (8″), we get :

$L = L_o e\, [(r+p)—v]t$ where $v \equiv \sigma w + (1—\sigma)a$

From (2) : $W = W_o . e^{wt}$

Thus, that labour's share of output :

$$S_L = \frac{WL}{Y} = \frac{W_o .\ e^{wt} .\ L_o .\ \exp\ [(r+p)—v]t}{Y_o .\ \exp\ (r+p)t}$$

$$\text{i.e.}\quad S_L = \left(\frac{W_o\ L_o}{Y_o}\right) .\ e\ [w—(r+p)—v]t$$

$$= S_L^o .\ e\ [w—(r+p)—v]t$$

$$= S_L^o .\ e\ [(1—\sigma)\ \ (w—a) — (r+p)]t$$

$$\delta(\text{In}\ \ S_L)/\delta t = [(1—\sigma)\ (w—a) — (r+p)]$$

Now we can distinguish three different cases :

(a) If $\sigma = 1$, then $\delta(\text{ln}S_L)/\delta t = — (r+p) < o$, the labour-share will be declining.

(b) If $\sigma > 1$, and $w > a$ (the self-sufficiency condition), then $\delta(\text{In}S_L)\delta t < o$.

(c) If $\sigma < 1$, and $w > a$ (the self-sufficiency condition), then

$$\frac{\delta \text{ln} S_L}{\delta t} \begin{cases} > 0 \\ = 0 \\ < 0 \end{cases} \quad \text{as} \quad (1—\sigma) \quad \begin{cases} > & (r+p)\ /\ (w—a) \\ = & (r+p)\ /\ (w—a) \\ < & (r+p)\ /\ (w—a) \end{cases}$$

The above indicates that as the economy strives to achieve self-sufficiency, whether the labour-share of output will increase, decrease or remain the same will depend on the relative magnitudes of different production parameters.

On the Structure of Input and Product Markets in Cotton Weaving Industry of Bangladesh: A Case Study Using Firm Level Data*

by

NUIMUDDIN CHOWDHURY**

This paper formulates and, to an extent, practises an extended empirical framework for meaningfully examining certain structural aspects of input and product markets in cotton weaving industry of Bangladesh, using firm-level data. The study finds, *inter alia*, that input markets are imperfect with significant price variations arrayed against small-scale producers, but that the presence of merchants who seek to maintain the *status quo* leads to a partial neutralisation of the adverse price variation effects. The study further finds the cloth market to be product-differentiated.

I INTRODUCTION

The nature of markets has a critical influence on the level, composition and distribution of the fruits of economic growth. A structure of market which fails to maintain a reasonable correspondence between the private and social costs of, say, using a production input will result in sub-optimal allocation of resource, possibly in the immediate form of an inappropriate choice of technique. Likewise, there may conceivably be product markets whose structure is dominated by middlemen who seek to

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siphon off an exploitative portion of the economic surplus at the expense of the direct producers. In this case, the private benefits of producing the good in question will understate the social benefits, with undesirable sectoral composition of investment, employment, skills and output. And finally, there sometime exists a situation in particular developing countries where the whole hierarchy of factor and product markets suffer from a historically determined polarity among agents in economic power, wealth and information. Such polarisation fetters the pace of development by effectively shunting the relatively deprived agents off the realm of productive utilisation of what endowments they have.

A study of the structure of markets is therefore an important precondition of properly studying the causes, character and consequences of economic development. With this perspective in view, the present paper offers a case study of certain aspects of the structure of input and product markets affecting three types of cotton-weaving units in Bangladesh in the mid-seventies : handloom units, cottage powerloom units, and large-scale cotton-weaving units.[1] We hope, this exercise will improve our understanding in two types of area : (a) cognitive, and (b) policy-issues. As for the first, this author has argued elsewhere [6] that a good deal of the empirical choice-of-technique literature, which purported to make judgements on relative efficiency of different techniques, should be seriously qualified due to its failure to differentiate between the market-structural as opposed to production-function influences upon relative efficiency, measured in net monetary terms.[2] At a second level, case studies of market structure impinging on productive units in an industry can reveal whether there exists any discriminatory price variations arrayed against particular producers with certain correlates. On another plane, where, for a variety of reasons, agents are not functionally highly specialised but have a duality of productive occupation, (as actually is the case with a large segment of the cotton weaving industry in Bangladesh), it is of interest to identify the primary occupation of the agents. This will involve, usually, an examination of the agents' decisions concerning labour use, and of their non-labour endowments. Both considerations are germane to how labour and other markets perform.

By facilitating a better cognition of the nature of the growth process, studies of market structure also facilitate policy formulation. One area of

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[1] For definitions of these categories, see [6]

[2] This stricture applies to all these works [2 ; 3 ; 4 ; 8 ; 9 ; 10 ; 11 ; 12 ; 14 ; 16 ; 21 ; 23 ; 26 ; 28 ; 29 and 30].

immediate benefit may be the sub-sectoral investment priorities ; another, pricing of production inputs, especially the secondary ones ; a third, the ascertainment of the causes why certain well-intentioned and technically competent policies may have failed to produce the desired results.

II. THE ISSUES AND THE DATA BASE

Issues

The focus of this paper is on the following types of issues : Are there, any "distortionary" and/or discriminatory price and quantity differentials amongst units producing broadly similar products, and, if so, to what extent ? Were such differentials interfering with their approximation to the relevant efficiency frontiers ? Were there some institutional modalities which mollified the impact of these differentials ? Finally, to what extent is the market for cloth in fact competitive ?

Before we lay out the major empirical questions before this paper, a few remarks may be in order on the concept of market structure. In the literature on industrial organisation, market structure refers to (a) the extent of market and its rate of change ; (b) concentration in market shares ; (c) demand and supply characteristics and especially their variability ; (d) market risk and more generally uncertainty and (e) technological and organisational possibilities and limitations. It is with the components of (c) above that we seek in this paper to identify input market structure. More specifically, it is with the supply characteristics of two secondary inputs viz., yarn and intermediate imports, relevant to three types of cotton weaving units in Bangladesh, that we shall be mostly concerned in this paper.[3] We shall be concerned (a) to describe the relative situation of the classes of enterprise studied in respect of (i) unit private cost of the two inputs ; (ii) the pattern of comparative quantities utilised, the comparative basis being the requirements at some realistically desired output levels ; and (b) to partly explain why relative input prices and quantities are what they are.

These issues are analysed on the basis of the data provided by the following questions : (i) What are the relative balance in economic power

[3] We have presented elsewhere [6] the nature of capital and labour markets relevant to our sample of producers.

among the enterprises concerned, and their market partners? (ii) How price elastic is derived demand, especially given rising prices? (iii) Are mercantile elements peripheral or predominant in the marketing modalities; and if the latter, what are the typical mercantile motivations concerning surplus generation/extraction or economic/social exploitation of weaker agents? (iv) What are the objectives behind and the efficacy of, the government regulations in the markets at hand? What is the pattern of relative quantities of the inputs utilised, and how best to explain it, whether in terms of price relativities, or mercantile motivation concerning the continuity of the fundamental structure?

This paper tries to answer these questions within the following structure. : Section III examines the yarn market in an exhaustive manner. Considerations of demand seasonality, price formation, inequities of yarn allocation and the differential impact of the partial integration of the sample mills on their own unit yarn costs are brought together in this section. Section IV takes up the market for intermediate imports while Section V looks at the cloth market : at how, for instance, it is segmented by the hand-weavers' close knowledge of rural demand on the one hand and rigidities on the part of the management of the mills on the other, compounded by other policy-induced and spatial factors. Section VI offers a brief discussion of the main conclusions.

Data

The main sources of the data on which this paper is based were obtained from two sets of sample surveys conducted by the author. These surveys were sponsored by the Bangladesh Textile Mills Corporation (BTMC) for a research project on the comparative productive efficiency of the Mills versus non-Mill sectors of the cotton weaving industry of Bangladesh in 1976/77. One set of surveys related to the handloom and powerloom enterprises while the other to the nationalised spinner-weavers.

Limitations of time and resources precluded the possibility of working with a fully representative national sample. It has been our endeavour, however, to make the sample as comprehensive as possible. To arrive at the sample for each of three sectors, we had to follow somewhat different methods.

The units in the handloom sector were selected on the basis of two-stage sampling procedure. First, all units in parts of three important handloom centres viz., Narsingdi, Shazadpur and Tangail were completely

enumerated. The enumerated units were then stratified by classes of installed looms. However, as the number of units covered in the enumeration in the three areas were different from each other for random reasons, the sample for each area that was selected for final interview was determined using different sampling fractions. The fractions chosen were such as to give us a reasonable number of observations for each of the areas surveyed. In the second step, a total of 413 units were selected for the final interview. Out of this, 158 were from Narsingdi, 113 from Shazadpur and 142 from Tangail. However, in this paper we used data from the Narsingdi and Shazadpur sample only.[4]

As for powerlooms, a list of units in the district of Dhaka was obtained. Out of 25 units, 10 were randomly selected.

As for the mills sector, information was collected from all the 25 spinning-cum-weaving mills owned by BTMC, through a structured questionnaire. Some additional information was also obtained from the BTMC headquarters.[5] In order to cross-check some of the information obtained from the handloom weavers, we further interviewed 42 yarn merchants operating in Narayanganj, Narsingdi, Shazadpur and Tangail. It is hoped that the data collected about the traders' social and economic status, the marked difference between the weavers' status and levels of income/wealth as compared with the traders, will be regarded as important and novel aspects of essential supporting documentation concerning the structure of the handloom industry.

III. THE MARKET FOR YARN

The Demand for Yarn

The relatively sharp variation among the sample units in respect of the entrepreneurial correlates and the scale of operation would appear to dictate separate treatment of their market situations. In the rest of this paper we therefore present all findings separately for the handloom and powerloom units, and the mills. One of our principal concerns here would be to test certain so far untested propositions sometimes advanced about

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[4]Tangail was excluded mainly because it became clear during the processing of data that Tangail and Narsingdi were fairly similar.

[5]Yet another source of information was some data independently collected by the author for the Industrial Workers' Wage and Productivity Commission of which he was the Member-Secretary.

the nature of the demand for yarn by the commercial weavers. To illustrate, the conventional wisdom is that handweavers are essentially dual in occupation, combining weaving in the (agricultural) lean months with active interest in farming in the other parts of the year. The assumption underlying this is one of compatibility between the activity peaks in farming and weaving, the two prime rural economic activities. If true, this would mean that the demand for yarn is rather seasonal, and further that the weavers have no concern with what happens to yarn prices during the peak period for farming. If however, prices are found to be relatively high during the agriculturally peak period, then whether a weaver would continue (as in the previous lean periods) with weaving would turn on the relative earnings realisable from weaving *versus* farming. Yarn prices in this view do not occupy a central position in their economic life, because weaving is seen to be a source of 'pin-money' only.

This situation is however different from the one where a solid majority of weavers regard weaving as their main occupation, where there is seasonality but one that is forced by the *seasonality* of the demand itself, by the imperfections of the market for credit, and by low investment in social overheads, particularly roads. In this case, of course, seasonality of weaving is a *fait accompli* for the weaver, to which he has to do his best to adjust. Unlike in the previous case, his survival is closely related to the price of yarn. As it happens, for the entrepreneurs covered in our sample, weaving is the main occupation [6, Ch. 4], so that it is the factors noted above that are the relevant ones. Therefore, as a preliminary for studying the nature of demand for yarn, we wish to explore the following questions : What is the time profile of the seasonality in weaving ? More specifically, is the relation between the seasonal peaks in weaving and farming one of congruence or conflict ? If it is one of conflict, then does a liberal provision of the ownership of non-weaving assets represent a leverage with which to increase production possibilities ? And, finally, can we affirm that, despite the possibility of a certain extent of occupational duality, weaving remains the primary economic interest of the sample units ? These questions are now taken up, in that order.

Table I shows the nature of the seasonality of activity of the handloom and powerloom units. If we define a month to be in the seasonal peak if 50% or more of sample entrepreneurs indicated it to be a "busy" production period, we find that October through January are in the peak for both size classes of the handloom sample. The peak period for the powerloom units is longer, from September through May. Can we account

for this seasonal pattern, especially for the handlooms? Three reasons come to the mind. First, the largest single farm crop of Bangladesh, i. e. *aman* rice, is harvested all over the country between October and December. It is these months which are regarded as constituting the peak of farming activities, too. A bulk of the aggregate rural consumption expenditure naturally takes place during these, and the following one or two months.

TABLE I

SEASONALITY OF THE PRODUCTION AND DISTRIBUTION ACTIVITY OF THE HANDLOOM AND POWERLOOM ENTERPRISES : 1976/77

(all figures are percentages)

Type of Enterprises — % of Respondents Reporting the Following Months to be among those when Production Rate is at its Highest

Particulars (1)	March (2)	April (3)	May (4)	June (5)	July (6)	August (7)
	March-August					
(A) : Handloom Units :						
1-14 Looms	17	28	8	3	5	18
15 + Looms	23	23	10	4	8	12
All Units	18	27	8	3	5	17
Powerloom Units	90	80	60	40	40	30
	September-February					
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
1-14 Looms	42	63	95	89	67	42
15 + Looms	49	73	100	98	85	66
All Units	43	64	96	90	69	45
Powerloom Units	70	80	100	100	100	100

Sources : Data from the sample surveys

Second, transportation during these dry winter months is easier and less risky.

Third, the monsoon month harbours technical difficulties as well for the handweavers in that solar light and heat—natural inputs which handweavers rely on relatively more due to their restricted access to the capital markets—are in short supply in these months.

All this goes to show that by the very nature of things, the activity peaks in weaving and farming must coincide. The implication of such coincidence is that gainful switching of employment of a purely seasonal nature between the two activities is of restricted scope. This observation could have been qualified if, in fact, average land endowment was so favourable that farming remained the more important occupational influence on entrepreneurs' decisions about where to put his time. Such, however, is not the case : the mean ownership of all land, including homestead and other land incorporated in the weaving units, is found to be 1.19 and 3.09 acres for the units in 1-14 and 15+loom-classes respectively. Mean operational land holding sizes for the two classes does not change the picture : 1.26 and 2.82 acres respectively. Mean land ownership for the whole handloom sample is 1.42 acres, while mean operational land holding size is 1.45 acres.

Such values for mean land ownership on operational holding do not allow viable farming units, especially when, as we show below, land ownership is unequally distributed.

As Table II shows, the larger size-class, which accounts for only 22.5% of the cases, own 45.6% of the farm land. The distribution of operational holding is unequal practically to the same extent. The Gini coefficient for both variables is about 0.64, which is reasonably close to the national picture as a whole.[6]

In order to exlpore further the dependence of weavers on weaving itself, Table III examines the extent of farming and non-farming work done by the handloom entrepreneurs during the 'busy' and other months. It is clear that, despite the overlap between the peak in farming and weaving, the needs for survival are such that work outside the weaving enterprise remains arguably important for the handloom weavers. The monthly number of days of work done outside weaving is 8.5 when busy and non-busy months are all taken into calculation. In other words, the handloom sample has an annual average of 100 days of non-weaving work per

[6] The fact of unequal distribution applies not just to land, but to a greater extent, to other types of assets as well, as shown in Table II.

entrepreneur. We must note that it was beyond the scope of our survey to collect data about the intensity of non-weaving work done. However, it can be argued, on the basis of data presented in Appendix Table A. 1, that non-weaving work is intermittent and/or is done when the weaving unit is having a routine closure for maintenance or for allowing rest to exhausted weavers, or for allowing the owners to visit the local *haat* (market) to procure yarn or sell cloth.

TABLE II

PATTERN OF OWNERSHIP OF LAND AND OTHER PRODUCTIVE ASSETS AMONG THE HANDLOOM SAMPLE

(Percentages)

Particulars	1-14 Looms (N=176)	15+ Looms (N=51)	All Sample (N=227)
1	2	3	4
1. % of Each Size-class in Total no. of Cases	77.5	22.5	100.0
2. % Distribution of Farmland Owned	54.4	45.6	100.0
3. % Distribution of all Operational Land Owned	54.8	45.2	100.0
4. % Distribution of Cultivated Land, Including Net Quantity of Land Rented in	61.3	38.7	100.0
5. % Distribution of the Non-Weaving, Non-Land Assets	50.8	49.2	100.0
6. % Distribution of the Value of Assets at (5) above	37.3	62.7	100.0

Note : (a) Each case surveyed was given equal weight.

Sources : Data from the sample surveys.

The suggestion that non-weaving work may be intermittent is lent further support by the fact that the respondents do purely manual work only in a small proportion of cases (Table A. 1). Surely, it is more feasible to combine intermittent non-manual off-weaving work with weaving than would be possible in the case of predominantly manual work.

Thus the nature of seasonality, the structure of assets owned by the weavers and the pattern of their non-weaving work all point to the fact that weaving is the primary occupation for the majority of weavers. To the extent that they engage in non-weaving activities, it is mainly to supplement their income and it does not entail any loss of potential cloth

output. This is an important finding, as it implies that the demand for yarn by the handloom weavers will be price inelastic over a large range in response to rising prices.[7]

TABLE III

THE NATURE OF THE NON-WEAVING WORK PERFORMED BY THE RESPONDENTS ON THE SAMPLE: 1976/77

(All figures are weighted average number of days per month)

Particulars	Handloom Units			Power-loom Units
	1—14 (looms)	15+ (looms)	All Units	
1	2	3	4	5
1. Monthly Days of Farming Work, in 'Busy' Months	1.68	1.61	1.67	Nil
2. Monthly Days of Farming Work, in other Months	4.48	2.67	4.26	Nil
3. Monthly Days of Non-farm Work, in 'Busy' Months	1.03	1.68	1.11	11.2
4. Monthly Days of Non-farm Work, in other Months	1.34	2.49	1.48	14.6
5. Monthly Days of Farming Work, all Months	6.16	4.28	5.93	Nil
6. Monthly Days of Non-farm Work all Months	2.38	4.17	2.60	12.0

Note: The weights are the relative loomage of the unit owned by the respondents in question in 1976/77.

Source: Data from the sample survey.

The Pricing of Yarn

We propose to examine here the processes of price formation in the yarn market. We begin this exercise with a review of how the unit costs of yarn have behaved over the years. Table IV shows the picture between the years 1973/74 and 1976/77. It is to be noted that the unit

[7] Our concern here is with the relationship between the demand for yarn and the *increase* in its price, as the costs of raw cotton and imported yarn have actually been rising over the years.

costs will depend on the staple-mix of cotton and, as may be seen from the table, the mix has varied tremendously in the four-year period. The choice of an appropriate staple-mix is therefore quite important in calculating average unit costs. We have used two alternative weighting procedures. First, we have used the average proportions of the staple varieties imported during 1975/76 and 1976/77 as the relevant weights, on the ground that there has been a change in the structure of cotton requirements of Bangladesh after the devaluation, and that these two recent years give a better picture of the shape of things to come. However, total cotton bill of the BTMC mills divided by the total quantity involved is another quite valid weighted average, suitable for other purposes. As such, we have included both sets of averages in Table IV.

TABLE IV

COST OF IMPORTED COTTON AND YARN IN BANGLADESH 1973/74—1976/77

(Taka)

Year	Cotton Received ('000lbs)	Index of (2)	Cost Per lb		Index to		Index of Unit Import Price		Share of Staple-length above 1 in Total %
			Weigh-ted	Weigh-ted	(4)	(5)	Yarn	Co n	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1973/74	51.8	63	9.23	6.44	70	50	65	44	64
1974/75	113.7	138	7.64	6.26	58	49	94	110	5
1975/76	87.4	106	11.49	10.88	88	85	117	81	14
1976/77	77.3	94	14.73	14.59	112	114	83	120	37

Notes : (a) All indices are based on the average values for 1975/76—1976/77 as equal to 100. In the case of cols. 8 and 9, original indices, which had 1972/73 as the base, were adjusted to reflect a new base. Col. 4 is total cotton bill divided by total quantity. Col. 5 is the figures obtained after weighting by average proportions of the staples in the total cotton imported.

Sources : [6, Table 5.6].

The following findings emerge from this table. First, both the import quantities and unit cost of cotton have been highly variable in the period studied. Second, since 1974/75, import quantities have continuously fallen, while unit costs of cotton have risen quite rapidly in 1975/76 and 1976/77.

TABLE V

YARN OUTPUT COMPOSITION AND EX-MILL PRICES OF YARN, 1973/74-1976/77

	Output-mix of Yarn: % Share in Total Yarn Output of			Ex-mill Prices of Various Types of Yarn, Taking All-cotton/Mixed Yarn: Unweighted Average Price[a]				Weight Average Price[b]			
	Coarse	Medium	Fine	Coarse	Medium	Fine	All	Coarse	Medium	Fine	All
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. 1973/74	15	74	11	6.30	12.34	18.95	12.51	9.22	12.86	18.62	13.08
2. 1974/75	10	78	12	7.77	16.00	26.58	16.70	11.10	16.74	25.94	17.60
	—	—	—	(123)	(130)	(140)	(133)	(120)	(130)	(139)	(134)
3. 1975/76	13	70	16	7.74	15.69	26.48	16.55	10.28	15.68	25.58	16.88
	—	—	—	(99)	(98)	(99)	(99)	(93)	(94)	(99)	(96)
4. 1976/77	11	65	24	9.19	17.11	35.22	20.21	11.47	18.07	34.42	21.58
	—	—	—	(119)	(109)	(133)	(122)	(112)	(115)	(134)	(128)

Notes: (a) The figures in cols. 5-8 are arrived at by weighting the figures in cols. 2-9, Table 5.7, by industry average relative shares of two types of yarn. The ratios of pure-to-mixed yarn are (.88 : .12) for 1973/74 ; (.82 : .18) for 1974/75 ; (.77 : .23) for 1975/76 ; and (.70 ; .30) for 1976/77.

(b) To estimate these, (quantity)—weighted quality-specific averages for both all-cotton and mixed yarn were first calculated. These were then further weighted by the average relative shares of all-cotton and mixed yarn in the industry's output in order to arrive at over-all averages.

(c) The figures in parentheses are the percentages of each year's prices relative to the matched price for the previous year.

Sources: BTMC Annual Reports for relevant years (appendices).

While it is of course natural that the large devaluation of May 1975 will raise Taka costs in 1975/76, it is the subsequent increase in 1976/77 that is relevant for our subsequent discussion. Third, the unit import prices of both yarn and cotton have risen over the four-year period, the latter by three-folds. Finally, the variation of the staple-mix is quite erratic. We should note especially that 1976/77 is very different from either 1974/75 or 1975/76 in that the relative share of cotton of staple-length of over 1 inch in total import is higher, and thus is consonant with a sharp increase in the relative output of fine yarn, as documented elsewhere by the author [6, Ch.2].

In view of these observations, we may reasonably expect the ex-mill prices of yarn to increase too during 1975/76 and 1976/77. Table V shows the behaviour of the ex-mill prices of all types of yarn combined on both weighted and unweighted basis.[8] Whether we examine the unweighted or the weighted averages, ex-mill prices have moved up and down from one year to next, though their underlying direction is no doubt upward.

Given the large relative increase in the ex-mill price of yarn in 1976/77, we may expect the handloom and powerloom enterprises to face a sympathetic rise in the prices at what we shall call, for the want of a better name, the retail levels, i.e., where the users of yarn buy directly from the yarn merchants. Are the merchants going to lower their margins, and raise their prices less than proportionately to the ex-mill prices ? Or, will they sense that time is on their side, and decide to rise them more than proportionately ?

The answer to these questions turn on the nature of the retail market for yarn ; in other words, on the balance of the economic power between the weavers and the yarn merchants. The more numerous the weavers are relative to the merchants, the less likely is it that they are able to hold their own against the traders. The overall decline in supply of yarn in 1976/77, documented elsewhere [6, Table A2.2] and the rather drastic movement in the output-mix in favour of fine yarn in 1976/77 made it unlikely that the wishes of the traders and the weavers about the proportionate differential between the ex-mill and retail price would easily coincide. An examination of the nature and extent of the social and economic power of the traders would probably give some insight as to balance of bargaining power and how it would affect the process of price formation.

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[8] For separate information on the unweighted prices of all cotton and mixed yarns of coarse, medium and fine yarn, see Appendix Table A.2.

Table VI shows the educational and economic status of an average trader in the two survey areas. The following conclusions may be drawn from it. The educational level of the traders is not markedly high as compared with that of an average handloom weaver. However, their children clearly have superior educational status. The traders appear to be far wealthier and, given the power which, in a rural context, comes from having land, much more influential as well. The average land ownership (of 6.4 acres) is about 4.5 times the average of the weavers in the two handloom areas surveyed. Even if we take no account of the ownership of other assets, this very large gap in the landed status probably means that the traders weild much greater economic power versus the weavers in the event of any divergence of interests. The inclusion of other assets would only make the contrast still more glaring.

TABLE VI

SELECTED PERSONAL, AND SOCIAL CHARACTERISTICS OF THE SAMPLES OF YARN TRADERS AND HANDLOOM WEAVERS, 1976/77

Particulars (averages)	Traders			All Handlooms (N=717)
	Narsingdi (N=19)	Shazadpur (N=14)	All (N=33)	
(1)	(2)	(3)	(4)	(5)
1. Age (years)	42 6	44.1	43.2	42.50
2. Educational Score	2.9	2.7	2.8	1.92
3. Educational Score of Father	1.6	1.2	1.4	1.40
4. No. of Years of Schooling Per Child	6.8	7.4	7.0	4.40
5. Total Land Owned (acre)	8.2	4.0	6.4	1.42
6. Value of Land Owned (Tk. '000)	204.0	116.0	166.7	42.78
7. Value of Non-land Asset (Tk. '000)	141.2	165.0	151.3	25.78
8. Value of Working Capital in Yarn Trade (Tk. '000)	118.3	146.7	130.0	n a

Note : n.a. means not applicable.

Source : Sample survey data.

Yet, it is interesting to note that what the traders charge from the weavers do not seem to be unjustified on economic grounds alone. Table VII shows that there is an inverse relationship between credit-worthiness (measured by the average proportion of bad debt in the total credit advanced) as reported by the traders, and the proportionate premia charged

by them. However, it is also true that the variation in the premia is also a function of differences among the traders in turnover. Thus weavers served by traders with low turnover pay higher premia relative to weavers who deal with larger traders. An interesting relationship is displayed by the observation that in both areas traders with larger turnover (as measured by the number of weavers per trader) have a higher proportion of weavers with above 10 looms. It is reasonable that the larger weavers, having larger yarn requirements, look up to the traders with larger absolute provision of credit. That they may be better credit risks or occasion lower administrative cost per transaction (due to the scale economies) may persuade larger traders to prefer them as trading partners. The smaller weavers are left no options but to deal with traders with a smaller turnover. If the premium charged per transaction is a function of credit-worthiness of the borrower and the turnover of the trader, then one would expect an empirical relation between these variables on purely economic ground.

Table VII also shows the retail prices charged by the traders on cash purchase of important yarn counts. These averages are somewhat lower than those reported by the weavers themselves, but the proportionate difference (usually under 2.5%) is quite small.

The data presented so far suggests that, despite having disproportional social and economic power, the traders do not charge a price that is not justified by economic criteria also.[9] However, this is not to say that they will not sometimes charge prices which the weavers will only grudgingly pay, if such prices are warranted by rather unusual supply situations. The important question is when do the traders decide to exercise control which they clearly have ; and when they do, what operational from does this normally take ? This requires an understanding of the nature of operational dependence of the weavers on their trading bosses. The degree and nature of this dependence will be clear from the data on the following variables : (a) the scale of purchase per weaver ; (b) the extent of purchase on credit ; (c) the premium paid per transaction on credit ; (d) the length of time-lag between the contracting of the debt and its complete pay-off ; and (e) the extent of its repayment in kind as against in cash.

Table VIII presents data regarding these aspects of the yarn markets. As for the handloom units, the following observations can be made :

[9]It is also interesting to know that when the weavers were asked to identify their most crippling impediment to viability, only just over one-third of them reported traders' exploitation as the number one factor [6, Appendix 3.1].

TABLE VII

PREMIA AND PRICES CHARGED ON YARN BY TRADERS AT 'RETAIL' LEVEL IN TWO SURVEY AREAS, 1975/76, 1976/77

(All figures are arithmetic means)

Particulars	Narsingdi			Shazadpur			All		
	Upto 15[a] (N=12)	Above 16[a] (N=7)	All (N=19)	Upto 15[a] (N=3)	Above 16[a] (N=6)	All (N=9)	Upto 15[a] (N=15)	Above 16[a] (N=13)	All (N=28)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. No. of Customers Per Trader	10.3	20.4	14 0	11.0	22.2	18.5	10.4	21.2	15.4
2. No. of Weavers with Upto10Looms	6.8	9.0	7.0	7.0	9.7	8.8	6.8	9.3	8.0
3. No. of Weavers with 11+ Looms	3.5	11.4	6.4	4.0	12.5	9.7	3.6	11·9	7.3
4· Yarn Turnover (Tk. '000s)	762	1924	1190	861	2046	1651	782	1980	1338
5. % of Bad Debt in Total (%)	5.0	4.77	4.91	5.0	4.85	5.90	5.0	4.81	4.90
6. % of Premium Charged Per Transaction on Yarn Sold on Credit	2.90	2.71	2.83	3.0	2.80	2.87	2.92	2.75	2.84
7. Retail Price on Cash Buying of 32s. 1975/76 (Tk/1b)	17.92	17.68	17.83	n. a	n. a.	n. a			
8. Retail Price on Cash Buying of 32s. 1976/77	25.45	24.98	25.59	n. a	n. a	n. a			
9. Retail Price on Cash Buying of 40s. 1975/76[b]	22.93	22.30	22.70	29.83	29.27	29.46			
10. Retail Price on Cash Buying of 40s. 1976/77[b]	31.75	31.02	31.48	43.14	42.87	42.96			

Notes : (a) Respondents are here classified by the number of weavers usually buying yarn from them.

(b) For Shazadpur, these prices relate to the 60s.

(c) For rows 7-10, figures are not weighted for the two areas since prices are not for the same product. The other figures of cols. 8-10 are obtained by weighting the data for the two areas by the number of traders interviewed.

(i) the typical weaver buys yarn on a quite small scale, (ii) buying on credit is much more extensive than cash buying (iii) access to cheaper public yarn outlets (i. e., mill-gate supplies) in both years under study have been more liberal for the larger handloom units, (iv) the working capital credit is of a very short maturity, and finally (v) smaller units take longer to pay off a given debt, even when options for paying in both cash and credit are open. Taking the handlooms as a whole, it is reasonable to posit that the paucity of own funds or favourable access to public credit sources causes the smaller handloom units to depend proportionately more on credit, and to take longer to pay off. The result is adverse credit-rating, a small credit allocation and a higher premium paid. The access of these units to public yarn outlets is more restricted for the same reasons. On the other hand, the larger handloom units are probably more liquid, can arrange speedier pay-off, and this together with their larger scale of yarn purchase account for the lower average premia they pay on yarn credit.

TABLE VIII

SCALE OF PURCHASE AND NATURE OF CREDIT IN THE YARN MARKET, BANGLADESH

(All figures are weighted averages)

Particulars	Handloom Units			Power-loom Units	Sample Mills
	1-14 loom	15+ loom	All units		
(1)	(2)	(3)	(4)	(5)	(6)
1. Average Purchase (in days requirements).	5.46	6.10	5.54	25.0	50.0
2. Proportion of Yarn Requirement Paid for in Cash (%)	31.80	48.80	33.90	100.0	100.0
3. % of Premium Paid on Yarn Bought on Credit (per transaction)	3.36	2.38	3.24	—	—
4. % of Yarn-debt Paid off in Cash (%)	90.00	92.40	90.30	—	—
5. Time-lag between Debt and Full Pay-off (nos. of days)	11.00	9.60	10.80	—	
6. % of Yarn Needs from Public Outlets, 1975/76	2.60	7.80	3.20	34.0	100.0
7. % of Yarn Needs from Public Outlets,1976/77	0.20	1.64	0.38	12.0	100.0

Notes : (a) All figures of this table have been weighted by relative consumption of yarn in the year concerned. The only figure for 1975/76 has been duly weighted by relative consumption in 1975/76.

Sources : Data from the sample surveys.

Turning now to the powerloom units, these have the greatest liquidity and the most favourable access to all types of yarn. Buying of yarn on credit is non-existent : indeed 4 out of 10 producers own their own retail yarn outlets. As such, these units have had much better access to the yarn market relative to handloom units. In particular, their markedly advantageous access to the public yarn outlets must be underlined.

For both handloom and powerloom units, the access to the public yarn outlets have been higher in 1975/76, and this is due to the higher industry-wide stock of yarn prevailing in 1975/76. A few comments about the relative prices of yarn in 1975/76 and 1976/77 at the 'retail' level must now be made. In doing so, we propose to pay special attention to the proportionate differential between the ex-mill and the 'retail' level prices for the handloom units. This is because, so far as it is a *percentage* increase over and above the ex-mill price, it includes all charges, including the traders' profits (and any 'black' charge that is appropriated by the mill and other officials). An increase in the proportionate differential means that the yarn users have failed to maintain the market *status quo*, that they are having to pay what may loosely be called higher 'gross' margins over and above ex-mill prices.

Table IX is suggestive of rather marked differences in the comparative prices, and the contrast becomes more glaring in 1976/77. For example, for 32s count, handloom and powerloom units are found to have paid proportionate differentials of 25.5% and 20.7% respectively in 1975/76 which rose to 62.3% and 45.9% respectively in 1976/77. On the whole, between 1975/76 and 1976/77 the average unit prices of yarn paid by hadloom weavers increased by between a minimum of 36% for 80s to a high of 45% for 60s.[10] It will be instructive to see if the traders extracted any scarcity premia in this situation of rising prices. To investigate this question, note first of all that 'retail' price can be defined as made up of (i) ex-mill price ; (ii) wholesaler's margin including his costs ; (iii) retailer's costs ; (iv) retailer's 'fair' profits ; and (v) scarcity premium, if any. Retailer's transport and administrative costs were known from the returns from the

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[10] As discussed elsewhere [6, ch. 2], the causes of the sudden increase of the yarn prices in 1976/77 are (a) an absence of compensatory revision of yarn prices in 1975/76 despite sizeable increase in the cotton costs ; (b) further increase of cotton costs early in 1976/77 ; (c) rapidly depleting cloth and yarn stocks ; and finally (d) a substantial decline in the delivery of cotton in 1976/77.

traders' survey. So were the data on the interest costs on stocks. The only relevant data that we did not have was about wholesaler's margin including his costs. We assumed that a 10% mark-up on the ex-mill price was a reasonable gross margin for the wholesaler. From this was estimated the retailer's surplus which, when compared with norms about 'fair' retailer's profits, after all conceivable costs are deducted, (including risk premium), is used as the basis for inferring whether and to what extent scarcity premium has been extracted.

Table X presents the findings of this exercise. First, there is no evidence in 1975/76 of any scarcity premia being extracted. On the contrary, traders dealing in 60s have only taken a modest gross profit per unit of yarn. However, the situation in 1976/77 is markedly different. Even after allowing for the assumed 'fair' profits of the retailers, there still remains a large proportionate excess, which in fact was distributed, somehow or other,

TABLE IX

COMPARATIVE AVERAGE UNIT YARN PRICES PAID BY THE ENTERPRISES IN THE SAMPLE WEAVING SECTORS, 1975/76, 1976/77

(All figures are weighted, in Tk./lb)

Particulars	Handloom Units		Powerloom	Mills
	Narsingdi	Shazadpur		
(1)	(2)	(3)	(4)	(5)
1. Price, 32s, 1975/76	18.2	—	17.5	14.5
2. Price, 40s, 1975/76	23.0	—	21.7	18.2
3. Price, 60s, 1975/76	—	30.2	—	25.9
4. Price, 80s, 1975/76	—	40.3	—	32.8
5. Price, 32s, 1976/77	25.8	—	23.2	15.9
	(142)		(132)	(110)
6. Price, 40s, 1976/77	32.1	—	28.7	19.8
	(140)		(132)	(109)
7. Price, 60s, 1976/77	—	43.7	—	30.2
		(145)		(117)
8. Price, 80s, 1976/77	—	54.7	—	52.3
		(136)		(159)

Notes : (a) Averages are weighted, weights being enterprise-specific relative consumption of yarn in the year concerned.

(b) Figures, if any, in parentheses show proportionate increases in 1976/77 with respect to 1975/76.

(c) The symbol (—) in this table means that the number of cases is less than 3.

Sources : Data from the sample Surveys.

among the powerful operators in yarn trade. For 40s and 60s counts, these proportions are found to be 31.7% and 18.2% respectively.[11] Thus we see that although the traders' relationship with the weavers is not as exploitative as it is sometimes made out to be, the traders neverthless do not hesitate to exercise their bargaining power to extract a premia in times of scarcity and rising prices.

TABLE X

PRICE FORMATION IN RETAIL YARN MARKET IN THE SURVEY AREAS, 1975/76, 1976/77

(All figures are Tk./lb)

Particulars	1975/76		1976/77	
	Narsingdi	Shazadpur	Narsingdi	Shazadpur
(1)	(2)	(3)	(4)	(5)
1. Ex-mill Price	18.22	25.86	19.83	30.18
2. EX-wholesaler's Price	20.04	28.45	21.81	33.20
3. Retailer's Handling and Administrative Financial Cost	0.30	0.35	0.35	0.40
4. Retailer's Cost (Row 2+3)	20.34	28.80	22.16	33.60
5. Retailer's 'Fair' Gross Profit	2.03	2.88	2.22	3.36
6. 'Fair' Average Retail Price	22.37	31 68	24.38	36.96
7. Average Retail Price Paid by Weaver on Cash Purchase	22.98	30.20	32.11	43.70
8. Retailer's Gross Profit as % of Costs when Sale is on Cash	13.00	4.90	44.90	30.00
9. Possible Scarcity Premium, when Sale is on Cash	0.61	— 1.48	7.73	6.74
10. Scarcity Premium as % of Retailer's 'Fair' Price when Sales is on Cash	2.70	— 4.70	31.70	18.20

Notes : (a) Row 2 is row 1 multiplied by 1.10 ; row 5 is row 4 multiplied by 0.10 ; row 6 is row 4 plus row 5 ; row 8 is row 7 divided by row 4 ; row 9 is row 7 minus row 6 ; and finally row 10 is row 9 as % of row 6. Note that we assume that wholesalers charge a mark-up on costs of 10 % on ex-mill price to cover their costs and gross profits. We also assume that it is fair for retailers to only charge a 10 % gross profit on their costs. We have also made clear that the resultant estimates of scarcity premium have to be regarded as reflecting the existence and scope of such premium. Its actual distribution between the wholesalers, retailers and, in 1976/77, the mill-officers, is not attempted, and is indeed not strictly necessary for our purpose.

[11] It is widely known that 1976/77 witnessed a good deal of armtwisting of the traders by the members of the industrial bureaucracy, and we may suppose that perhaps the greater proportion of this scarcity premium accrued to the latter. Of course, a part no doubt accrued to the traders as well.

TABLE XI

REQUIREMENT AND PROVISION OF YARN INPUT IN THE HANDLOOM AND POWERLOOM UNITS, AND THE MILLS, 1976/77

(All figures are on a per-operating-loom basis)

Particulars (Pounds of yarn)	Handloom Units			Power-loom Units	Mills		
	1-14 (looms)	15+ (looms)	All Units		Older Mills	Newer Mills	All Mills
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Monthly Requirement of Yarn at RADO[a]	32.8	30.8	32.6	152	301	277	284
2. Optimal Inventory Levels	16.4	15.4	16.3	76	301	277	284
3. Actual Inventory of Yarn During Survey	3.2	4.1	3.3	47	133	694	530
4. Monthly Consumption of Yarn, 1976/77	28.3	24.0	27.8	137	293	285	287
5. Ratio of Row 4 to Row 1 (%)	86	78	85	90	97	103	101
7. Ratio of Row 3 to Row 2 (%)	20	27	21	62	44	250	190

Notes: (a) Entrepreneurs in the handloom and powerloom sectors reported minimum yarn inventories of half a month's requirement as being desirable. RADO abbreviates "realistically attainable desirable output" and corresponds to output levels which, in a realistic sense, 'ought' to have been attainable with the constraints in force. Note that RADO is not the same thing as the capacity output. For details, see [6, pp. 130-32].

Having looked at how prices form, we shall now have a brief look at the comparative quantities of the yarn consumed by the sample units in relation to their requirements. Table XI presents the relevant details.

If we confine ourselves to the requirement of yarn per operating loom, we have evidence here that both handloom and powerloom units have not done too badly relative to the mills in providing for yarn requirements. Though actual inventories of yarn with the non-mill units are smaller relative to 'desired' stocks as compared with the mills, over eight-tenths of the requirements per operating loom are met. The need for economy in using scarce credit is well understood by the trader and his client. In this connection, too much should not be read into the low figures of yarn stocks with the weavers. (It means however that the weavers spend relatively more *time* in procuring yarn, due to greater frequency of procurement.) Note however that this picture, cast in terms of per-operating-loom basis, is incomplete in that we do not know anything about what proportion of installed looms is, on average, in operation. This has been discussed elsewhere [6, ch. 6], but suffice it to say for the moment that the attachment of smaller weavers to the traders enabled them to keep in operation in 1976/77 a higher proportion of loomage relative to the larger weavers.

In sum, while the traders certainly dominate the retail market, this is to an important extent neither entirely self-centred nor entirely short-sighted. This will have to be borne in mind.

IV. THE MARKET FOR IMPORTS

In Bangladesh, the allocation of virtually all industrial imports is regulated through comprehensive official import licensing. Two main types of private importers are admitted : commercial importers who are licensed to procure and sell a given line of products ; and direct producers licensed to import for their own use. The currency is overvalued, and the tariff structure cascaded : the resultant excess demand for imports is reflected in the usually sizeable scarcity premia fetched by them. While the Chief Controller of Imports & Exports (CCIE) issues licenses to the commercial importers, the direct producers are served by the Directorate of Textiles (DT), under the Ministry of Textiles. For the latter category, registration with the DT is the first major step towards entry into the market for imports on preferential terms. An official assessment of import requirement, a favourable report from the inspecting official and sustained good

rapport with the DT are essential for continued registration. The second step is to ensure bi-annual issue of import permits from the CCIE. The entitlements are fixed by law, but the actual import permits obtained often depend on the personal equation of the entrepreneurs concerned with the CCIE. The large mills, being in the public sector, are under the co-ordination of the BTMC, as opposed to the DT. Though BTMC has a greater official nexus with the various ministries than small units, decisions are often taken slowly due to bureaucratic procrastination.

Table XII shows the annual entitlement per loom registered for the sample units. Powerlooms are found to have the largest unit entitlement, and this is due to a crude legal definition of a powerloom in the private sector for the purposes of the fixation of entitlement.[12] The mills' access to non-cotton imports is found to have been quite small in 1976/77, and we know from above why this may have been so. However, the vast majority of the producers in the hadloom industry are in a clearly disadvantageous position in the market for imports because they are not registered (Table XIII).

TABLE XII

NON-YARN IMPORT ENTITLEMENT PER LOOM PER YEAR FOR THE UNITS ON THE SAMPLE, 1976/77

(All figures are in Tk.)

Particulars	Sectors		
	Handlooms	Powerlooms	Mills
(1)	(2)	(3)	(4)
1. Per Loom Annual Entitlement by Inputs			
(a) Sizing Materials	158	790	n.a.
(b) Spares	790	7900	n.a.
(c) Dyes/Chemicals	1106	—	n.a.
(d) Total Entitlements	2054	8690	4004

Notes: (a) Upto 1976/77 the indicative allocation prepared by the Ministry of Commerce did not decompose total allocation by units. So it is only possible to show the total allocation on a per-loom basis.

Sources: Data from the sample surveys.

[12] A powerloom is defined as one which is driven by electricity, but other vital details (e.g., whether loom is imported or locally made, etc.) which may have a bearing on suitable entitlement, are not mentioned. These rates were first fixed when virtually all powerlooms were in private large scale units. After Liberation, the entitlements were raised due to inflation. However, these increases were irrelevant for the large units because they were now in the state sector. Meanwhile, the small scale powerlooms became probably the unintended beneficiaries of these enhanced rates. The glaringly large sums reported by these entrepreneurs for requirements and input of recurrent imports for 1976/77 must thus be taken as overstatements.

The following main conclusions may be drawn from Table XIII. First, the handloom units are virtually totally excluded from the market for preferential imports. Second, thanks to the credits from the traders and to own resources, import needs are met to the same extent as they are for the mills. Third, the real problem is one of the terms of exhange in the market for imports. There is a strong case for de-centralising the distribution of import licenses, as this would only promote efficiency by giving the handloom producers the better terms of exchange they deserve.

TABLE XIII

REQUIREMENT AND PROVISION OF IMPORTS FOR THE SAMPLE UNITS, 1976/77

(All figures, unless indicated, are Tk.)

Particulars	Handloom Units			Power-loom Units	Mills		
	1-14 Looms	15+ Looms	All Units		Older Mills	Newer Mills	All Mills
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. No. of Units with Official Import Entitlements	4.95	9.2	5.5	7	7	17	24
2. % of Units in 1 in Total No of Cases	4.46	34.3	8.1	70	100	100	100
3. Non-yarn Import Requirement/Loom Yarn, 1976/77	2402	2227	2380	17380	5593	5079	5228
4. Non-yarn Import Input/ Loom/Year, 1976/77	2122	2120	2122	14844	4638	4740	4710
5. Import Finding/Loom/ Year, 1976/77	465	1556	599	8510	n.a.	n.a.	2561
6. Ratio of 4 to 3(%)	88.3	95.2	89.1	85.4	82.9	93.3	90.1
7. Ratio of 5 to 4(%)	21.9	73.4	28.2	76.4	n.a.	n.a.	54.0

Notes: (a) These estimates, it appears, are biased upward due to overstatements of import requirements and inputs in 1976/77. However, the biases are unlikely to be much in excess of 25% or so. This is because these looms are mostly made from local machine shops. It is possible that they may therefore have a high requirement of maintenance imports. Hereinafter, we shall assume that average non-yarn imports input as well as requirements are both 75% of the reported values.

Sources: Data from the sample surveys.

V. THE MARKET FOR CLOTH

At the risk of some over-simplification it may be said that the three classes of enterprises are producing for different groups of consumers, and also to meet different needs of the same group of consumers. The bulk of the handlooms' output is consumed in the rural areas, sometimes in the immediate vicinity of the location of production. Probably the most important reason for this rural-centricity of the markets for the handloom cloth is that it is to the advantage of the producers to be able to personally know the response of the market, which makes their 'product-planning', however crude, that much more flexible. Further, these rural markets are separated from the ambit of the mills due to high transport costs even during those few months of the year when communications are manageable. Finally, the marketing methods of the handloom weavers were found to be highly personalised—an advantage in a milieu where 'personal touch' remains an important part of success in selling. These factors imply that the cloth market is segmented by climate, product-planning, and sales strategy. Again, a small part of the handloom output consists of delicacies which are unsuitable for longer production runs in the mills. These are consumed by the urban middle and upper classes. This is an example of market segmentation due to tastes. Finally, various governments have sought to segment the market by reserving some particular fabrics for the handloom units only.

The above means that the sample units may actively compete only in a small number of items. This is the impression that one gets from examining the data presented in Table XIV, where the distribution of cloth output of the sample units is presented.

The main finding of Table XIV is that a predominant proportion of handloom yardage consists of what the mills do not produce in a large quantity. However, the range of competition between the mills and the handlooms may be narrower than even what is suggested by the above figures. Take, for instance, the case of *sarees*. While the mill-made *saree* is a standardised product, the handweaver seeks to develop a real or apparent speciality of his own in what he makes, whether in the consistency of texture, or in dyeing. Long experience does create process-related insights of how to invest his products with some distinction : perhaps, a little refinement of the dyes may lead to a greater gloss, and this may be his hallmark. In short, the handloom weaver may go all out to break the market into small parcels.

TABLE XIV

DISTRIBUTION OF THE CLOTH OUTPUT OF THE SAMPLE UNITS, 1976/77

(Percentages)

Categories	Handloom Units: Narsingdi	Handloom Units: Shazadpur	Powerloom Units	Mills
(1)	(2)	(3)	(4)	(5)
1. Saree	66	100	13	18
2. *Dhuti*	—	—	—	—
3. *Lungi*	27	—	—	2
4. Long Cloth	—	—	38	8
5. Markin	—	—	—	43
6. Poplin	—	—	—	2
7. Shirting	4	—	8	10
8. Drill	—	—	8	3
9. Umbrella Cloth	—	—	13	—
10. Bed Sheet	—	—	15	—
11. All Others	3	—	5	9

Notes: (a) Percentages are weighted by the relative output of the units in question; (b) Percentages may not add to 100 due to rounding.

Sources: Data from the sample surveys.

TABLE XV

THE PATTERN OF PRODUCTION OF HANDLOOM-COMPETING CLOTH BY MILLS, 1973/74—1976/77

(Yardages are in mn.)

Type of Mills	Output of: Saree, Lungi	Output of: Saree Lungi Shirting	Total Output	Output of: Saree, Lungi	Output of: Saree, Lungi, Shirting	Total Output
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Old	15.66	16.62	36.22	13.03	13.85	31.35
	(43)	(46)	(100)	(41)	(44)	(100)
2. New	4.38	10.44	45.25	2.28	7.62	40.14
	(10)	(23)	(100)	(6)	(19)	(100)
3. All	20.04	27.06	81.47	15.31	21.47	71.49
	(25)	(33)	(100)	(21)	(30)	(100)

Notes: (a) The figures in parentheses are the proportions of the row total for a given period. The percentages of clos. 2 and 3, and 5 and 6 are not mutually exclusive, and are not required to add to 100.

Sources: BTMC Annual Reports, relevant years (statistical appendices).

There is also evidence that the mills are increasingly shying away from a head-on competition with the handlooms. As may be seen from Tables XV and XVI, over three-fourths of the output of *sarees* and *lungies* (the staples of the handlooms) of the mills originate in the older mills. Moreover, both older and new mills have reduced the proportion of handloom competing output, in total yardage in the second period examined (Table XV). For example, the old mills' yardage of *sarees* and *lungis* fell from 43% during the first period to 41% during the second, while the matched figures for the new mills are 10% and 6% (Table XVI).

TABLE XVI

THE DISTRIBUTION OF HANDLOOM-COMPETING OUTPUT BETWEEN OLD AND NEW MILLS, 1973/74 TO 1976/77

(Percentages)

Type of Mills	Output of		Total Output	Output of		Total Output
	Saree, Lungi	Saree, Lungi, Shirting		Saree, Lungi	Saree, Lungi, Shirting	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Old	78.1	61.4	44.4	85.1	64.5	43.8
2. New	21.9	38.6	55.5	14.9	35.5	56.1
3. All	100	100	100	100	100	100

Sources : Table XV above

How are we to explain these findings ? Two possible explanations come to mind. First, the BTMC seeks not to turn the full fury of its competitive abilities at the handloom units. Driving the weavers out of business would be suicidal : after all, they constitute a captive market of yarn, and BTMC knows that most of its mills are incapable of export competition. This result is achieved in part by confining the production of handloom competing fabrics in its older, high-cost mills. For the most part, these varieties are coarse, cheap sarees, meant for the large and increasing low-income urban population. The second explanation is related, and has to do with a certain rigidity on the part of the BTMC management concerning the capacities of its cloth-finishing facilities. We have seen that historically only 20% or less of the mill yardage was sold in finished form. Whatever the reasons for this pattern, the resultant rigidity induces the BTMC to concentrate its own finishing activities

in that segment of the market which is the least quality-and aesthetically-conscious as well as accessible year round. The emphasis on relatively coarse products in the output of the old mills shown in Adpendix Table A.3, fits well with this hypothesis.

VI. CONCLUSION

This study set out with the premise that the markets for cotton-weaving industry in Bangladesh are imperfect, to a large degree due to historical and institutional inequality among agents. A proper documentation of these imperfections calls for an extended empirical methodology which probes the price formation, quantity differentials and mercantile aspects of the market processes. We have tried to apply one such framework in this study. The following are its more important findings.

First, although there is a degree of occupational duality, weaving is the pre-eminent element for the majority of handloom weavers. Conflict between the activity peaks in weaving and farming, together with unviable endowments of land for most hand-weavers imply that their lives are welded into the vicissitudes of the weaving economy. One implication here is that the demand for yarn, given rising prices, is rather inelastic, which, coupled with restrictions on pricing flexibility, means that weavers' profit margins are more squeezable than those of the yarn merchants. Second, we find that the yarn merchants lie somewhere in the middle of the spectrum between being unabashed exploiters and gratuitous patrons. While they do extract scarcity premia at opportune moments, they also accommodate reasonably well the weavers' yarn requirements which partly offset the adverse effects of the discriminatory price differentials, Third, the price variation among the handloom/powerloom units on the one hand, and the large-scale units on the other is a result not just of the competitive advantages of scale but also of differential economic and institutional power between small producers on the one hand and the merchants and the officials associated with the yarn distribution on the other. Fourth, the market for intermediate imports on preferrential terms shows the same polarisation in the pattern of the benefits realised. The whole of the handloom sector is found to be virtually excluded from this market, which increases their dependence on more expensive, marcantile sources of imports. And finally the cloth market is found to be segmented, by producers' deliberate product strategy, heteorogeneous tastes and spatial considerations.

All the above will have important implications for analysis and policy, in several areas. We shall only highlight those germane from the view point of appropriate methodology for ascertaining relative efficiency of a set of techniques in an industry. The first implication is that unless an exercise in comparative efficiency explores these market-structural questions, it may well end up ascribing the whole of the possible efficiency differential between techniques to inherent inferiority of one, whereas possible social or institutional handicaps were at least partly significant in causing the differential.

The second implication, stemming from the segmentation of the cloth market, is that, a clear specification must be made of what qualifications attach to possible judgements on relative efficiency, based on data that gloss over aspects of segmentation.[13]

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[13]The issues relating to the relative efficiency of alternative weaving techniques will be discussed more fully in a forthcoming paper by the author.

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Appendix

TABLE A.1

TYPE OF WORK DONE, FREQUENCY OF CONTACT WITH THE MARKETS, AND OF ROUTINE CLOSURE OF OPERATIONS OF THE HANDLOOM AND POWERLOOM UNITS

Particulars	Handloom Units			Power-loom Units
	1-14 (looms)	15+ (looms)	All Units	
(1)	(2)	(3)	(4)	(5)
1. **'Busy' Months :**				
(i) % of Cases where Work is Manual	25.8	3.6	23.1	nil
(ii) % of Cases where Work is Supervisory	33.1	89.1	40.0	nil
(iii) % of Cases where Work is Manual-Cum-supervisory	41.1	7.3	36.9	nil
2. **Other Months :**				
(i) % of Cases where Work is Manual	28.4	6.2	25.7	nil
(ii) % of Cases where Work is Supervisory	36.1	90.9	42.8	100
(iii) % of Cases where Work is Manual-cum-supervisory	35.5	2.9	31.5	nil
3. Days/Month, the Unit Operates in 'Busy' Months (Nos.)	25	25	25	25
4. Days/Month, the Unit Operates in Other Months (Nos.)	22	21	22	23
5. Monthly Trips to the Local Markets, 'Busy' Months	7.7	8.3	7.8	2.5
6. Monthly Trips to the Local Markets, Other Months	7.4	7.9	7.5	2.5

Notes : Figures in rows 3-6 are appropriately weighted.

Sources : Data from the sample survey.

TABLE A.2

EX-MILL PRICES OF TYPES OF YARN, 1973/74-1976/77

(All figures are simple averages : Tk/lb)

Year	Average Ex-mill Prices[a]/							
	All-cotton Yarn				Mixed Yarn			
	Coarse	Medium	Fine	All	Coarse	Medium	Fine	All
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1973/74	6.24	12.23	18.89	12.43	6.75	13.18	19.41	13.12
1974/75	7.94	16.40	27.21	17.10	7.03	14.20	23.68	14.89
1975/76	7.96	16.13	27.20	17.00	7.02	14.24	29.09	15.03
1976/77	9.32	17.44	35.90	20.54	8.88	16.35	33.64	19.45

Notes : (A) Averages' are based on the prices of the various counts of yarn within a given category, e.g. coarse, medium or fine. (b) In a few cases, basic price data were not available for all yarn counts for 1973/74 and 1974/75, though they were produced, not always in small quantities. It would have been misleading to exclude them. These prices were therefore estimated assuming that the rates of year-to-year price change for these counts were the same in these two years as those for the remaining counts in the same quality-range. The yearly price data are therefore comparable, and exclude hosiery yarn. All averages are unweighted.

Sources : See [6, Table 5.7].

TABLE A.3

THE COARSENESS AND DENSITY OF THE TEXTURE OF THE OUTPUT OF OLD AND NEW MILLS, 1969/70-1976/77

(Figures are averages for counts or density)[a]

Detail	YEAR							
	1969/70		1973/74		1975/76		1976/77	
	Old	New	Old	New	Old	New	Old	New
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Warp	22.4	27.9	22.6	28.6	26.2	29.5	25.6	29.5
2. Weft	23.1	29.1	25.8	29.6	28.2	30.5	28.2	30.0
3, Reed	50.8	68.3	44.6	61.0	52.0	63.6	52.2	63.4
4. Pick	47.4	57.9	50.4	57.0	49.1	60.5	49.0	58.6

Notes : (a) Each average is weighted here, the weights being yarn-specific relative yardage of mills in both categories. Warp and weft refer to the yarn counts used for warp and weft. Reed and Pick refer to the density with which warp and weft have been woven.

Sources : Data from the sample mills.

The Effects of Crises on Differential Mortality by Sex in Bangladesh*

by

RAY LANGSTEN**

Male mortality is known to be lower than female mortality in South Asia in the normal times. But it has also been observed that during the crisis periods, this ordering is reversed. The experience of the 1974 famine of Bangladesh, as analysed in this study, confirms this reversal of relative mortality rates. But the usual explanations offered for this reversal are not borne out by the data pertaining to Bangladesh. Several other alternative explanations are explored, but cannot be confirmed due to the lack of appropriate data.

I. INTRODUCTION

Bangladesh, like other nations of South Asia, has an atypical pattern of mortality in which females tend to have a shorter expectation of life at birth than males. Indeed, female mortality exceeds that of males in virtually every age group. At the same time, as several writers on Bengal have observed, in times of crisis males appear to suffer disproportionately. That is, male mortality increases more than female mortality [9 ; 11 ; 14]. In this paper, I will examine the issue in greater depth, asking first whether it is true that male mortality increases disproportionately in times of crisis and then considering possible explanations for any disproportionate increase found.

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II. AGE-SEX SPECIFIC MORTALITY IN PERSPECTIVE

In most countries, since at least the middle of the last century when reasonably accurate data were first collected, females have been found to have had a longer expectation of life at birth than males [19]. At the same time, the countries of South Asia have not conformed to this generalization [10]. Historically, and continuing throughout 1950s and into the early 1960s, in the major nations of South Asia—India, Pakistan and Sri Lanka—males have lived longer, on average, than females.

Even though one sex has a higher expectation of life at birth, however, this does not necessarily mean that they have lower mortality in every age group. For example, although females outside of South Asia have for many generations tended to live longer than males, until recently female mortality exceeded that of males in certain age groups. Higher female mortality occurred most often during the childbearing years. However, in many populations females also had higher mortality at other ages, particularly during childhood [20]. Similarly, in South Asia, while males have a longer expectation of life at birth, they generally suffer higher infant mortality and sometimes have higher mortality in other age groups as well. In Bangladesh, and throughout Bengal (including Bangladesh and the Indian state of West Bengal), a longer male expectation of life at birth appears to have been the norm historically and this male mortality advantage continues to the present time.[1] Indeed, recent data indicate that males enjoy lower mortality in virtually every age group—sometimes even among infants.[2] Thus Bangladesh has a mortality pattern consistent with that of the rest of South Asia, but one which is unusual when considered in terms of most international experience.

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[1] This male advantage does not appear in some data sets pertaining to Bangladesh. For example, the Demographic Survey of East Pakistan (DSEP) in 1961/62 and the 1974 Bangladesh Retrospective Survey of Fertility and Mortality (BRSFM) both found a slight female advantage in expectation of life at birth. Data from the Population Growth Estimation Study (PGE) in 1962-65 and from the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) covering 1966-69 and 1974-77, confirm the male advantage. (See [12]). The first two studies are cross-sectional retrospective surveys while the latter two involve prospective vital registration and in the case of the PGE, elaborate checks on the registration. Thus, the differences in findings may say more about biases in the measurement instruments used than about changing mortality patterns in Bangladesh.

[2] This is particularly the case for postneonatal mortality (deaths among children one to eleven months of age) while females do have lower neonatal death rates (mortality during the first month of life). See [9].

Causes of Higher Female Mortality

Because females are thought to have an inherent survival advantage researchers generally assume that higher female mortality is largely the result of discrimination against females [16, p. 156]. Certainly, most researchers argue that a strong bias in favour of males pervades Bengali society. Surprisingly, however, available data sources provide little evidence of the types of discrimination widely believed to be responsible for higher female mortality.

One major area of investigation has been age-sex differentials in food consumption and levels of malnutrition. Perhaps the most widely noted indication of discrimination against females is the tendency for males to be served first at meals. Most people believe that by providing first for males females receive less and lower quality food and that this results in higher levels of malnutrition among females of all ages. Indeed, available data show that males consume more calories, more protein, and more of other nutrients measured, and that this advantage is consistent across all age groups [4 ; 13]. However, males have greater metabolic needs. When sex differentials in nutritional requirements are controlled, the male bias is greatly reduced and in some age groups eliminated or reversed. For example, while research in the Matlab field research area shows that in the youngest (zero to four) and oldest (forty five plus) age groups males consistently receive a higher proportion of their caloric requirements than females, in the two middle age groups (five to fourteen and fifteen to forty four) the differences between the sexes in the proportion of nutritional requirements consumed is negligible [4]. The 1976 Nutrition Survey of rural Bangladesh does not present results by sex for children under nine years of age. However, in virtually every age group for which difference by sex is available, females actually tend to consume a higher proportion of their requirements of both calories and protein than males. Only males above seventy years of age consume a larger proportion of required calories, while males ten to nineteen and over seventy consume a greater share of required protein [10].

Consumption data are difficult to collect and are sometimes of questionable quality. Information on sex differentials in malnutrition provide a check on the consumption results. Data on nutritional status are available only for children. They are consistent, however, with the consumption findings. The Matlab consumption data show that among those zero to four years of age, males receive a greater share of their requirements. Both the Matlab and the Bangladesh nutrition survey data show that in

this same age group a smaller percentage of males are moderately or severely malnourished, although by some measures the differences are small [4 ; 10]. However, the Matlab data indicate that in the five to fourteen years age group, females consume a larger proportion of their nutritional requirements and, in this case the 1976 Nutrition Survey data are again consistent showing a tendency for males in the age group five to eleven to be generally less well-nourished [10]. If nutrition among adults also conforms to the consumption data, differences by sex in the level of malnutrition should be small until the upper ages when males should again be generally better nourished. These data on food consumption and nutrition show discrimination against females in some age groups. However, "common knowledge" and the normality differentials suggest that evidence of severe discrimination should be evident at all ages.

Another possible area of discrimination which could directly affect mortality is access to health care. The Matlab data show that male children are more likely to receive clinical treatment for diarrhoea than are female children [4]. Data from Companiganj thana in Bangladesh confirm this male bias in health care among children. However, published results show that among adults, males are only slightly more likely than females to receive medical care for incapacitating illnesses [6], and more recent analysis indicates that sex differences in use of health care are even smaller than previously thought.[3] In this case also there is less evidence of discrimination against females than had been expected.

Despite the lack of evidence, observers of the Bangladesh scene maintain that Bangladeshi females are the victims of discrimination ; that they are, in fact, more likely to be malnourished at all ages, that they receive, if not less, then certainly lower quality health care. Given the strength and universality of the belief that females are discriminated against, and the persistence of higher female mortality in virtually all age groups, it would be unreasonable to interpret the nutrition and health utilization data as showing that the presumed anti-female bias is small or nonexistant. It is equally, or perhaps, more likely that researchers have thus far collected the wrong data or not analyzed existing data properly, so as to expose the true nature and extent of discrimination against females. However, the results reviewed in this section do reveal how little is known about the causes of higher female mortality.

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[3] S.A. Chowdhury and W.L. Aldis, personal communication, December 1981.

III. INTRODUCTION TO CRISIS MORTALITY

By definition, onset of a food crisis puts special pressures on the population, particularly in places such as Bangladesh where most people are poor even in the best of times and where severe crises occur periodically. In such times people are forced to make choices about how to deal with threatening circumstances. Greenough [11] argues that there is a known, rational, and moral system for making these choices. In Bengal, adult males have "the premier role of leadership" in the family as well as at all levels of the larger society. Thus the adult male makes decisions about sales of property, separation of the family, and ultimately the allocation of food and other resources that may determine whether or not an individual will survive through a time of scarcity. These decisions are accepted by other family members because this male dominance is seen as appropriate and right [11, p. 379]. Given that males occupy positions of authority, that they apparently benefit from a strong pro-male bias, and that, in normal times they have lower age-specific mortality rates and a longer expectation of life, one would assume that in times of crisis males would use their favoured position and authority to gain a survival advantage. One would expect that the excess mortality suffered in times of crisis would fall disproportionately among females. For example, a recent set of population projections for Bangladesh assumes that excess crisis deaths will be allocated 60 per cent to females and 40 per cent to males. (1, p. 348). Surprisingly, it is males, not females who suffer the greatest share of excess crisis mortality.

In the remainder of this paper I will review available data dealing with this question and consider possible explanations for the unexpected pattern of crisis mortality.

Data

I will rely on data available from published sources. My main source will be the results of the vital registration system of the Matlab field research area of the International Center for Diarrhoeal Disease Research, Bangladesh.[4] These data cover the years 1966/67 through 1972/73 and 1974 through 1977. They will be supplemented with information on the

[4] Age-sex specific mortality rates for Matlab are published in [8], table 5. The data in this source, covering the first seven years, 1966/67 through 1972/73, refer to twelve-month intervals from May 1 through April 30. For example, the data for 1966/67 are for the twelve months beginning May 1, 1966 and ending April 30, 1967. See also [9], footnote 1, Tables 2, 3, and 4. These data, for the remaining four years, 1974 through 1977, refer to calendar years.

effects of the famine of 1943 from a survey conducted by Professor Mahalanobis of the Indian Statistical Institute.[5]

Effects of Crises on Age-Sex Specific Mortality Differentials

As noted above, the analysis of the effects of crises on mortality is based primarily on data from the Matlab field research area covering the period 1966/77. During this time there were two major crises in Bangladesh. The first of these was precipitated by flooding and a cyclone late in 1970 and aggravated by the War of Liberation in March through December 1971. Flooding is a chronic problem in the Matlab field research area. Indeed, the area was originally selected as a research site because it is low-lying, close to major waterways, and accessible by boat. These very traits make it unusually flood prone. Therefore it is likely that the flooding in September 1970 disrupted the lives of the people of the Matlab area and resulted in some crop damage. The cyclone of November 1970 did not have a major effect in the Matlab area, although it may have caused some further damage to the local 1970/71 rice harvest. However, the cyclone certainly caused major crop damage in areas not far from Matlab. This is important because the southeastern part of Bangladesh where the Matlab area is located is a rice deficit area even in the best of years. The flooding and cyclone would have increased this deficit, creating the potential for a severe food shortage in September-October 1971, just before the main harvest of the 1971/72 crop year.[6] Then in March 1971 the War of Liberation broke out. The war hindered the distribution of food within Bangladesh, blocked the import of relief supplies from abroad, and reduced crop production in 1971/72. However, despite resulting food shortages, the increase in the price of rice was not great and it remained only slightly higher than usual during 1970 and 1971.[7]

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[5] See [11], footnote 1, table 1. Greenough's 1943 mortality data are ratios of deaths to survivors in the sample interviewed in Dr. Mahalanobis's survey. The 1931 mortality figures are "life table" results. The details of their calculation are not presented. It is not clear what effect, if any, use of these different mortality measures might have on the analysis. The figures presented appear reasonable, both within and across years.

[6] For a description of the harvest pattern in Bangladesh and its relationship to food availability in the different seasons of the year, see [14, pp. 68-72].

[7] The modest price increase, despite the crop shortfall, has been attributed to a variety of factors. Perhaps the most important was the patriotic response of the people to appeals from the Bangladesh government in exile. For a discussion of the food situation in Bangladesh during and immediately after the War of Liberation, see, S.R. Bose [2].

The crisis in 1974/75 was considerably different from that of 1970/71. In 1974 there was severe flooding in Bangladesh. Because the Matlab area is so low and susceptible to flood damage, it suffered severe effects. However, on a nationwide basis the shortfall in crop production was small compared to that of 1970 or other years of flooding. Despite the relatively minor crop damage suffered in 1974, the increase in the rice price during 1974 was far greater than any other price rise since the Partition of South Asia in 1947. The real price of rice more than doubled in the last six months of 1974 and remained extremely high until February 1975. From that point the price fell fairly steadily, but did not reach a normal level until November 1975. This extraordinary price increase was due largely to internal and external problems, which interfered with the import and efficient internal distribution of foodgrains [15 ; 17].

The differences in these two crises and the nature of the impact of changes in rice production and rice prices make it somewhat difficult to determine the timing of their principal impact on vital rates. It is particularly difficult when evaluating the effects of the 1970/71 crisis, where there was a relatively large shortfall in rice production, but little increase in prices. An earlier analysis attempting to evaluate the impact of variation in the size of the rice harvest on mortality found no systematic relationship between these two variables [14, pp. 75-77] However, there may have been a direct effect of the flooding on deaths late in 1970 and an increasingly severe indirect effect resulting from the growing scarcity of foodgrain throughout 1971. This scenario is consistent with the plot of monthly death rates shown in figure 1, although the direct effects, if any, appear to be minor. Therefore, although some of the effects of the crisis of 1970/71 certainly fell in the 1970/71 data year, the principal effects were clearly between May 1971 and April 1972, and thus this is the period I will focus on when considering mortality changes due to this crisis.

In 1974/75, the timing of the crisis effects is easier to predict because the main effects were due to price changes, and the relationship between price fluctuations and mortality change is clearer. A distributed lags regression analysis of the response of mortality to price fluctuations has shown that the major impact occurs with a five month lag.[8] That is, five months after a change in prices, mortality will change in the same direction. Therefore,

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[8] For a more detailed discussion of the distributed lags analysis, see, [14 ; pp. 63-64].

MONTHLY CRUDE DEATH RATES (ANNUALIZED) 1966-1976

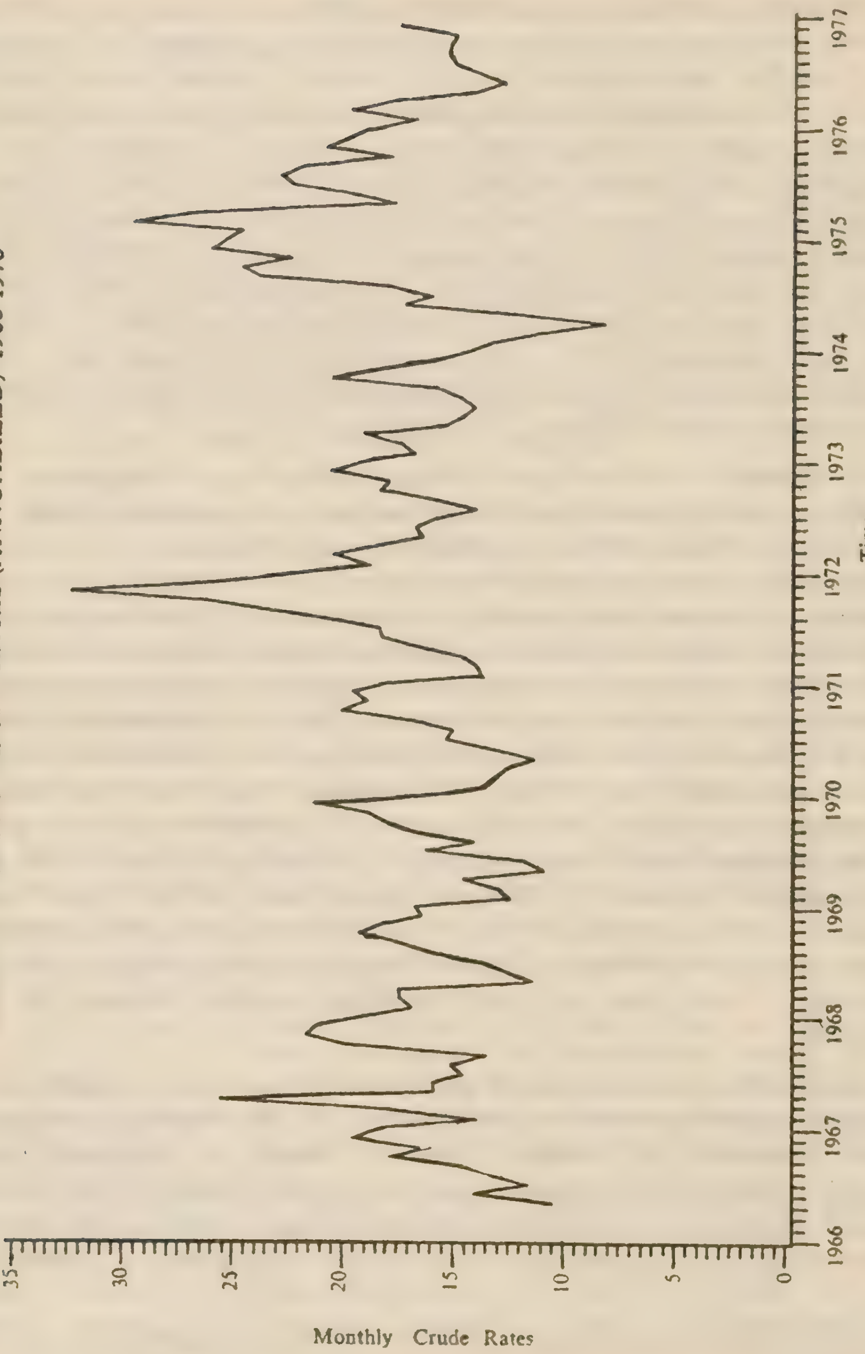

Figure 1

Source : Vital registration system, Matlab Field Research Area, International Center for Diarrhoeal Disease Research.

since the price of rice began to rise in mid-1974, the effects of this increase on mortality would not appear until the last month or two of 1974. The effects of high prices continued throughout 1975 and may also have influenced mortality in early 1976, since the price of rice did not return to its normal level until late 1975. The effects due to price changes ignore the direct effects on mortality caused by flooding in the Matlab area which also may have occurred in 1974. However, although figure 1 shows increased mortality from late 1974 through early 1976, in this analysis I will concentrate on the effects in 1975 since that is where the principal impact of the crisis of 1974/75 should be focused.

The analysis of crisis effects is based on mortality ratios. The ratios are computed by dividing the female age-specific mortality rate by the male mortality rate for the same age group. In general, the lower the mortality ratio, the greater is male mortality relative to female mortality. A ratio larger than 1.00 means that female age-specific mortality is higher than that of males. When the ratio drops below 1.00, male death rates are higher. If males suffer disproportionate increases in mortality in times of crisis, the ratios in crisis years should be lower than the ratio for normal periods. The analysis of ratios can sometimes be misleading. For example, when death rates are low, the same absolute increase in the death rate may have a substantial impact on the mortality ratio.[9] This problem does not affect the present analysis, however. In both data sets every shift in the mortality ratios that I interpret as substantively important is due to a greater absolute increase in male mortality in the given age group. Death rates on which the ratios are based are shown in the appendix.

Table I shows mortality ratios for the Matlab field research area for 1966/67 through 1977. The years in which the greatest effects of crises should be seen, 1971/72 and 1975, are underlined and in italic type. These results shows clearly that males do suffer disproportionate increases in mortality in times of crisis. Specifically, for three age groups, 15-44, 45-64, and 65+, the lowest recorded ratio is found in 1975. For the

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[9] For example, suppose that in a normal year males 15-44 years of age have a death rate of 3 per thousand and females a rate of 4 per thousand. The ratio would be 1.33. If, in a crisis year, mortality were to increase by 2 points per thousand among both males and females, the ratio would decline to 1.20. Despite the decline in the mortality ratio it would seem unreasonable to interpret this as a disproportionate increase in male mortality.

TABLE I

MORTALITY RATIOS (FEMALE/MALE DEATH RATE) BY AGE FOR THE MATLAB FIELD RESEARCH AREA 1966/67-1977[c]

	1966/67[a]	1967/68[a]	1968/69[a]	1969/70[a]	1970/71[a]	*1971/72*[a]	1972/73[a]	1974[b]	*1975*[b]	1976[b]	1977[b]
< 1	.89	.97	.85	.86	.95	*.96*	1.02	.93	*1.12*	.97	1.01
1— 4	1.50	1.36	1.12	1.49	1.65	*1.57*	1.65	1.80	*1.43*	1.33	1.74
5— 9	1.22	1.02	.93	1.20	2.36	*1.43*	1.22				
								1.41	*1.35*	1.29	1.33
10—14	1.92	1.63	1.19	1.63	.73	*1.25*	1.41				
15—44	1.08	1.10	1.47	1.08	1.52	*·94*	1.71	1.39	*.81*	1.03	1.27
45—64	1.05	.98	1.26	1.44	.80	*·71*	.81	.89	*.65*	.87	.85
65+	1.35	1.04	1.21	1.11	1.35	*1.14*	1.10	1.32	*.98*	1.02	1.00

Notes and Sources: (a) Computed from [8], Table 5.

(b) Computed from [9], Tables 2, 3, and 4.

(c) Crisis years in *italics.*

15-44 and 45-64 age groups the next lowest ratio is found in 1971/72. The hypothesized crisis effect is clearest in the 15-44 years age group. In each of the normal years the ratio is greater than 1.00, indicating higher female mortality. In the two crisis years, the ratio drops below 1.00 because the male death rates are higher than those of females. Among those 45-64 years of age, both the relative and the absolute increase in mortality during crises are greater for males than for females. As a result the mortality ratio drops at these times. Among those sixty-five and older the expected crisis effect is seen only in 1975, but here again there is a clear-cut shift from higher female death rates in previous years to higher male death rates during the crisis. Although the remaining age groups fail to show any meaningful decline in the mortality ratio, neither is there a tendency for the ratio in these groups to increase. The only instance of an unusually high mortality ratio in a crisis—thus indicating a disproportionate increase in female mortality — is for infants in 1975. In the other age groups, one to four, five to nine, and ten to fourteen, (or five to fourteen), there are no consistent shifts in the mortality ratios in crisis years.

These data are not as clear and consistent as desired. There are anomalies such as the male mortality disadvantage over the past several years in the age group 45-64. This is the only age group, other than infants, where males consistently have higher mortality than female. Male mortality in this age group shifted from a female disadvantage in the late 1960s to a male disadvantage, and why this male disadvantage has persisted throughout the 1960s are questions to which I cannot even begin to suggest answers at this time. Possible reasons range from data problems to unknown physical or cultural biases. Nevertheless, despite the anomalous ratios among those aged 45-64, even in this age group the male disadvantage increases in crisis years. There is also a considerable variation over time in the ratios for all age groups. The grossest example of this sort is found in 1970/71, when the ratio for those five to nine years of age jumps to 2.36 and for those ten to fourteen years of age drops to .73. Such variations are an inevitable problem, particularly in age groups where death rates are low and a relatively small shift in the rate for one sex may result in a large change in the mortality ratio.[10] However, despite frequent unex-

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[10] Despite the likelihood of variation in the ratios, the particular example cited looks suspiciously like a problem with the data. Such extraordinarily large shifts in opposite direction in two adjacent age groups suggest that either deaths or population of one sex, but not the other, are being attributed to the wrong age group. These unusual ratios could occur if deaths to males 5—9 were erroneously shifted to the 10—14 age group or if deaths to females 10—14 were shifted to the younger age group. Similarly if some males from the base population were shifted by mistake from the older to the younger age group, or females moved in the opposite direction, the bias in the ratios would be consistent with the results in Table I.

plainable variations in the ratios the only consistent change over time is for the ratios of some of the age groups to be unusually low in crisis years. Thus, although the published Matlab data currently available are not ideal for the task at hand and although they yield a number of results that cannot be readily explained, the one consistent finding in these data is that adult males experience greater increases in mortality in crisis years than do females of the same ages.

Besides the Matlab data, a survey by Professor Mahalanobis of the Indian Statistical Institute to evaluate the effects of the Great Bengal Famine of 1943 provides an opportunity to check the theory that males suffer disproportionately in times of crises using data collected in a different manner and pertaining to the last major crisis in Bengal before those of the 1970s. These data show a crisis effect on sex differentials in mortality like that found in Matlab. During the 1943 famine, the mortality ratios declined (using 1931 as a normal year for comparison) in the two age groups between ten and twenty and in the three age groups over forty (see Table II). There is also, in these data, the only disproportionate mortality increase among females, other than in infant mortality in Matlab in 1975. This occurred in the five to ten year age group.

TABLE II

MORTALITY RATIOS BY AGE FOR BENGAL: 1931 AND 1943[a]

Age-group	1931	*1943*
< 1	—	—
1— 5	.88	*.95*
5—10	.88	*1.10*
10—15	1.20	*.80*
15—20	1.42	*.93*
20—30	1.39	*1.40*
30—40	1.13	*1.13*
40—50	1.02	*.77*
50—60	.91	*.77*
60+	·93	*.74*

(a) Crisis year in *italics*.

Source : [II], Table 1.

Just as there are anomalies within the Matlab data, there are inconsistencies between the two data sets. The most serious of these inconsistencies is in the age groups which are affected. For example, among those aged fifteen to forty-four, Matlab data show a substantial effect, while the Bengal data show no effect between the ages of twenty and forty but some effect in both the fifteen to twenty and forty to fifty age groups. On the other hand, the Matlab data show no effect in any age group under fifteen while the Bengal data have an effect in the ten to fifteen year age group. Finally, although both data sets demonstrate an effect in the oldest age groups, this effect is moderate in the Bengal data, but relatively weak in the Matlab data.

With the data at hand, one cannot tell if these inconsistencies are due to genuine differences in the way crises affected the different populations at different times or to idiosyncracies in the data. Despite these inconsistencies, however, in both data sets there are substantial indications that males suffer disproportionately in times of crisis. The anomalies and inconsistencies do not negate this conclusion, but they do make it more difficult to understand the causes of this inversion of the sex differential of mortality.

Causes of Disproportionate Increases in Male Mortality in Times of Crisis

The disproportionate increase in mortality among males during crises has been observed by other researchers and each has offered an explanation for this unexpected finding.[11] The suggested explanations differ greatly: Greenough [11] argues that the traditional norms of male dominance dictate mortality patterns, while D'Souza and Chen [4] view this effect as an artifact of differential migration. Neither explanation, however, is consistent with available data.

Greenough, in his analysis of the 1943 famine, focuses on the role of the *kortā*—"the adult male who has the premier role of leadership in family and village"—as the arbiter of how the family confronts the crisis.

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[11] See [9 ; 11 ; 14]. The explanations offered for disproportionate male crisis mortality in each of these sources appear to be responsive to the characteristics of the data set being analyzed. While such deductive analysis is not wrong, it clearly can be misleading. This is particularly the case when, as here, different data sets provide somewhat different results and there is no basis on which to evaluate the relative accuracy of the studies involved. The analysis in this paper emphasizes the need for replication of studies and for caution when interpreting data.

He claims that the *kortā* secures advantages for himself and extends protection to those who are valued in Bangali society—adults and males [11, p. 323]. He concludes that the 'rank order of excess mortality... gives the pattern from which (the cultural) rules (governing survival) can be derived." [11. p. 373].

However, Greenough's own data, reproduced in Table III, are largely inconsistent with this argument. The importance of the *kortā* is seemingly validated by the observation that excess crisis mortality is the least among two groups of adult males, those twenty to thirty and thirty to forty years of age. Indeed, Greenough's theory is a reasonable explanation of the rank ordering of the first four age-sex groups in Table III. However, the favour of the *kortā* for culturally valued groups cannot explain the rank order of the remaining fourteen age-sex groups in Table III, for this ordering suggests that females, the old, and the young are, in many

TABLE III

ESTIMATED EXCESS CRISIS MORTALITY BY AGE AND SEX, BENGAL, 1943

(Ranked by level of excess mortality)

Age	Sex	Index of Excess Mortality
20—30	Male	1.41
30—40	Male	1.94
20—30	Female	1.99
30—40	Female	2.18
15—20	Female	2.19
40—50	Female	2.47
1—5	Male	2.53
10—15	Female	2.75
1—5	Female	2.79
15—20	Male	3.00
60+	Female	3.56
10—15	Male	3.92
5—10	Male	4.40
40—50	Male	4.57
5—10	Female	5.17
50—60	Female	5.78
60+	Male	7.30
50—60	Male	8.58

Source : [11], Table 33.

cases, more highly valued than males in the prime of life. For example, females ten to fifteen, experienced less excess mortality during the Bengal famine than did males in the three age groups five to ten, ten to fifteen and fifteen to twenty years of age. The rank ordering also suggests that females over sixty years old are more highly valued than all groups of males over forty. Furthermore, the Matlab data show that even males between fifteen and forty-four years of age, the age group which Greenough argues ought to be best protected by the power of the *kortā*, experienced greater increases in mortality than females during the two crises of the 1970s. To be sure, Greenough recognizes that his rank ordering has some weakness and inconsistencies. However, he still maintains that the "cultural .. determinants of mortality"...and by this he seems clearly to mean the role of the *kortā*—"are likely to be the most significant" [11, p. 369]. I believe that the evidence available fails to support—indeed, in many ways it contradicts—this argument. This is not to say that cultural factors play no role in determining mortality in times of crisis. However, to the extent that cultural factors operate, they are different from that of the *kortā* allocating resources so as to favour the traditionally valued segments of society.

In contrast to Greenough, D'Souza and Chen offer a largely demographic argument to explain the disproportionate increase in mortality among males during the crisis of 1974/75. They state : "During the crisis year of 1975, net out-migration of adult males was considerably higher than in other years. If the resident male population consisted of a less healthy group than the out-migrants, this might partially explain the observed pattern" [9, p. 264]. While this explanation is consistent with the data D'Souza and Chen present, it does not explain disproportionate increases in mortality among the young, for example in the ten to fifteen year age group in the Bengal data. More importantly, the hypothesized differentials in out-migration during crisis times are not supported by available data. The D'Souza and Chen argument makes two major assumptions : (1) in times of crisis males out-migrate at a higher rate than females ; and (2) the males who stay are at greater risk of death than those who leave. Although these assumptions cannot be properly tested with available data, results from research in Companiganj thana in south-central Bangladesh suggest that both assumptions are incorrect.

While it is clear that migration increased greatly in 1975, the Companiganj data indicate that females migrated at about the same rate as

males.[12] The relatively small sex differentials in migration suggest that the effects of migration on the health status of the remaining population were approximately equal for males and females. Thus the sex ratio of mortality would not be influenced. In addition, according to the Companiganj data, virtually all of the excess out-migration during the crisis of 1974/75 was among the landless. Out-migration among landowners, irrespective of how little land they owned, was little changed during the crisis. The Companiganj data also show higher mortality for the landless [14]. Therefore, the excess out-migration during the crisis should have reduced, rather than increased, the death rate in rural areas such as Matlab and Companiganj.

While it is relatively easy to point to the flaws in previous explanations of the male mortality disadvantage during crises, it is far more difficult to suggest alternative explanations that are consistent with and supported by available data. There are possible explanations which simply cannot be tested at this time. The importance of intrafamilial allocation of resources, for example, has been raised by many people. While it is universally conceded that in normal times females are disadvantaged (despite the scarcity of empirical support for this position, as discussed above), some people argue that in crises, females, who control many stages of food preparation and distribution within the family, may use this power to protect themselves and those who they value. This is a plausible argument, but there are no data with which to evaluate it. Others maintain that male mortality may increase because of the added stress of the crisis. They accept the central role of the *kortā* as leader of the family and protector of the lineage suggesting, however, that this position is not an advantage. Rather than the *kortā* deriving benefit from his power to allocate resources, he suffers extremely because of the responsibility placed on him. This stress, combined with malnutrition and the normal rigors of life in Bangladesh, may cause an increase in mortality. A related argument maintains that women in Bangladesh are better able to cope with stress than men. According to this view women experience greater stress than men in normal times for, although deprived, they carry a heavy burden of work.[13] This constant experience in dealing with stress enables

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[12] See [14 ; pp. 98—100]. The comparison of out-migration by sex is flawed in that the rates available pertain to females 10—24 years of age and males 15—54 years of age. Despite lack of comparability, these data show that males did not completely dominate out-migration.

[13] Work roles in Bangladesh are discussed in [3].

them to cope more effectively with crises. This stress hypothesis also is a plausible explanation for the disproportionate increase in mortality among adult males. It makes significant assumptions, however : for example, stress affects mortality in Bangladesh and either stress and/or its mortality effect are differential by sex. These issues are notoriously difficult to test, and at this time there are no data appropriate for this task.

There are several other explanations for the change in mortality patterns during crises, explanations more demographic in nature which could be further tested with existing, but not currently available, data. The first of these explanations can, at best, be a partial explanation for shifts in one age group. Crises not only increase mortality, but also lower fertility. [5 ; 14 ; 18]. In addition, in Bangladesh maternal mortality is the leading cause of death among women fifteen to forty-four years of age [7]. Since a crisis reduces fertility, it should also reduce mortality among women fifteen to fourty-four by reducing the risk of mortality. The potential contribution of this factor to explaining the male mortality disadvantage among those fifteen to forty-four could be estimated by evaluating changes during crisis in fertility and in the relative role of maternal mortality as a cause of death.

Another possible explanation combines the presumed cultural bias favouring males in normal times with a demographic explanation for excess male mortality in times of crisis. One of the possible side effects of normally low male mortality could be the creation of a pool of males at high risk of death. This could occur if males who are sickly are given special attention, and provided with a disproportionate share of food, medical attention, living space, leisure, or other resources which help them survive. This statement is not necessarily inconsistent with the lack of evidence of a male bias in the population as a whole, as discussed above. The affected group would not be so large nor the resources required so great as to substantially influence average indicators of food consumption, nutrition, and use of health facilities. Indeed, it may be precisely by focusing resources on certain relatively small, but valued groups, such as high risk males, that the accepted male bias affects mortality, but not the other indicators of well-being. In normal times, it may be possible to provide special attention and extra resources. In crisis years, however, these benefits may be unavailable, whether because resources are reallocated to family members better able to contribute to the family's welfare or because, even though these individuals continue to receive a disproportionate share of resources, this share of the diminished resource base is not adequate. Without these

benefits individuals in this high risk group may suffer very high mortality. At the same time, one would expect much of this effect to occur in the older age groups. However, in the data analyzed, the crisis effects in these groups are relatively modest, and the greatest effects are elsewhere.

Some of the disproportionate increase in mortality among males in the prime working ages may be explained by a theory focusing on metabolic needs. Working men and some of those who are old and sickly have a need for more and/or better food than others. Reductions in food availability may have more severe adverse effects on those with the greatest metabolic needs, even if they continue to receive food which might be considered adequate for other individuals with different metabolic needs.[14] The susceptible pool and metabolic needs arguments can be evaluated to some extent with existing data. For example, much could be learned by analyzing causes of death in different socioeconomic groups. However, such an analysis would, at best, provide clues as to whether or not these arguments are valid. Full evaluation would require detailed data on individual risk of mortality and nutritional requirements.

SUMMARY AND CONCLUSIONS

Although the data available for secondary analysis are not ideal for the task at hand, they confirme that in normal times Bangladesh conforms to the South Asian pattern of sex differentials in mortality with females generally having higher death rates, and they clearly show that, in crisis years, the differential is inverted, with males in certain age groups suffering disproportionate increases in mortality. This crisis effect on sex differentials in mortality has been noted previously and on this point all observers appear to agree. Disagreement arises, however, as to the reasons why death rates among males increase more than those of females in crisis years. Explanations offered previously are either contradicted by available evidence or appear to be, at best, partial reasons for changes in some age groups. In this paper, I have reviewed a number of suggested explanations, both cultural and demographic, which, in some combination, may provide an understanding of the mechanisms by which the normal sex-specific mortality differentials are reversed in times of crisis.

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[14] The importance of metabolic needs is indicated by the experience of American prisoners of war in Vietnam. It has been argued that POWs suffered malnutrition and mortality while consuming a diet which was adequate for Vietnamese. M. Meade, personal communication, November 1981.

Available data provide no information whatsoever on some of the hypothesized explanations and offer only minimal assistance in evaluating others. Some existing data, not currently available for detailed analysis, may be useful in examining some of the suggested reasons for change, particularly the demographic reasons. At the same time, interpretation of existing data, no matter how detailed the analysis, must always be tempered by the knowledge of substantial inconsistencies in available results. Moreover, in the absence of far more information about intrafamilial decision making processes and how these may change in times of crisis, it is impossible to understand fully the reasons for changes in the mortality disadvantage.

I have noted a number of important areas requiring further analysis. Not only is it not possible to explain the changes in sex differentials in mortality during crises, the mechanisms by which male mortality is kept lower than that of females in normal times is also unexplained. While the strong cultural bias favouring males offers a reason for lower male mortality in the grossest terms, likely intervening variables such as nutrition and use of health facilities show only modest evidence of this bias. Much more work is required to understand mortality differentials in Bangladesh. A better understanding of the causes of these differentials and short-term changes in them will help in developing programmes that can reduce mortality in good years and limit excess deaths during crises.

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Appendix

TABLE A.1

AGE-SEX SPECIFIC MORTALITY RATES OF THE MATLAB FIELD RESEARCH AREA 1966/67-1977.[c]

		1966/67[a]	1967/68[a]	1968/69[a]	1969/70[a]	1970/71[a]	*1971/72*[a]	1972/73[a]	1974[b]	*1975*[b]	1976[b]	1977[b]
< 1	Male	117.5	127.1	134.3	137.2	134.7	*149.3*	126.3	142.5	*165.1*	113.6	113.3
	Female	104.1	123.8	113.7	117.4	127.9	*143.8*	129.2	132.9	*184.1*	110.3	114.2
1— 4	Male	20.0	24.6	22.5	18.6	21.2	*28.9*	17.3	18.3	*28.8*	25.5	14.5
	Female	29.9	33.5	25.2	27.7	34.9	*45.3*	28.3	32.9	*41.3*	33.9	25.2
5— 9	Male	3.7	5.0	4.0	3.0	1.4	*9.4*	12.7				
	Female	4.5	5.1	3.7	3.6	3.3	*13.4*	15.5				
									2.78	*3.13*	2.78	2.16
									3.92	*4.23*	3.60	2.87
10—14	Male	1:2	1.6	1.6	0.8	1.5	*2.0*	1.7				
	Female	2.3	2.6	1.9	1.3	1.1	*2.5*	2.4				
15—44	Male	3.9	4.2	3.0	3.7	2.1	*5.2*	2.1	2.84	*5.24*	2.86	2.36
	Female	4.2	4.6	4.4	4.0	3.2	*4.9*	3.6	3.95	*4.26*	2.95	3.00
45—64	Male	15.0	18.0	15.6	16.9	15.8	*23.0*	16.1	18.42	*37.12*	18.99	17.80
	Female	15.7	17.7	19.7	19.2	12.7	*16.3*	13.0	16.36	*24.10*	16.57	15.11
65 +	Male	59.8	77.9	68.8	68.2	63.8	*112.6*	92.5	77.84	*113.41*	74.04	76.15
	Female	80.6	81.4	83.4	75.4	86.4	*128.6*	102.2	103.12	*111.48*	75.43	76.15

Notes and Sources : (a) From [8], Table 5.

(b) From [9], Tables 2, 3, and 4.

(c) Crisis years in *italics*.

TABLE A.2

AGE-SEX SPECIFIC MORTALITY FOR BENGAL : 1931 AND 1943[a]

Age-Sex Group		1931	*1943*
< 1	Male	—0—	*—0—*
	Female	—0—	*—0—*
1— 5	Male	5.9	*8.43*
	Female	5.2	*7.99*
5—10	Male	1.6	*6.00*
	Female	1.4	*6.57*
10—15	Male	1.0	*4.92*
	Female	1.2	*3.95*
15—20	Male	1.2	*4.20*
	Female	1.7	*3.89*
20—30	Male	1.8	*3.21*
	Female	2.5	*4.49*
30—40	Male	3.0	*4.94*
	Female	3.4	*5.58*
40—50	Male	4.2	*8.77*
	Female	4.3	*6.77*
50—60	Male	5.5	*14.08*
	Female	5.0	*10.78*
60+	Male	9.8	*17.10*
	Female	9.1	*12.66*

Notes and Sources: (a) From [II], Table 1.

(b) Crisis year in *italics*.

Fertility Behaviour under Uncertainty— A Mathematical Model*

by

TAWFIQ-E-ELAHI CHOWDHURY**

INTRODUCTION

Although significant amount of research has been conducted to understand and estimate social, cultural and economic determinants of fertility behaviour, little attention has been paid to the likely effects of uncertainty in the economic environments of an individual on his fertility behaviour. Many researchers referred to such possible link ; few, however, specifically investigated the issue. Of the few, Mead Cain [1] showed the role of children, particulary of sons, as a safeguard for parents against the vagaries of nature or machinations of men. Schnaiberg and Reed [2] developed a more general model incorporating the role of risk and uncertainty on family formation. Caldwell [3] identifies the role of transfer of wealth from children to parents as one of the determinants of fertility behaviour in under-developed countries. The variability of such transfers should then have some effects on fertility decisions. Similarly, if old-age-security is one of the factors influencing family size; the uncertainty attached to old-age income can be reasonably assumed to affect fertility behaviour.

In the following pages, a simple model has been developed to specifically examine the role of uncertainty of future income of parents in affecting their fertility decision.

MODEL

This is a two period model. We assume the following :

(1) y_O is the current income of an individual which is known with certainty.

(2) α is the proportion of current income foregone for rearing up children ($0 \leq \alpha \leq 1$).

(3) y_F is the future income, which is random, given by $y_F = F(\alpha y_O, \mu)$ where μ is a random variable.

---

*This is a part of on going research for Ph. D. degree.

**The author is a civil servant of the Government of Bangladesh and a Ph. D candidate at Harvard University, U. S. A., He is grateful to Prof. R. Repetto of Harvard University for his encouragement, guidance and many useful comments. The responsibility for any deficiencies lies, of course, with the author.

(4) There is no borrowing or lending.
(5) Individual is an expected utility maximiser.

Few words on the assumptions (2) and (3) will be in order. α as a choice variable in this model is a surrogate for number of children. It could be argued that choice of α may represent a choice of both number and quality of children. However, for poorer groups of a typical developing economy, significant improvement in the quality of children may involve such high value of α that very little will be left for current consumption. For these groups at least, α can be reasonably assumed to be a proxy for number of children. The function in assumption (3) incorporates the economic support that parents expect from young children when the parents are old (commonly discussed in the literature as oldage security). It also incorporates the uncertainty of future economic environment by assuming future income as random. The optimization problem can be written as :

$$\underset{\text{w.r.t. } \alpha}{\text{Max}}\ V = E[U(C_O, C_F)]$$

$$\underline{\text{st.}}\quad C_O = (1-\alpha)y_O$$

$$y_F = C_F = F(\alpha y_O, \mu)$$

The first order condition can be expressed as :

$$E\left[\frac{\delta u(C_O, C_F)}{\delta C_O}\right] = \left[E\frac{\delta u(C_O, C_F)}{\delta C_F} . F_{\alpha y_O}(\alpha y_O, \mu)\right] \qquad \ldots \qquad (1)$$

Suppose the individual has an additive utility function of the form :

$$U(C_O, C_F) = u(C_O) + (1+p)^{-1}\, u(C_F)$$

where p is the subjective discount rate. Let us also assume the following restrictions on the functions : $u^{I} > 0$, $u^{II} < 0$, which implies that the individual is risk averse. Figure (1) represents such restrictions.

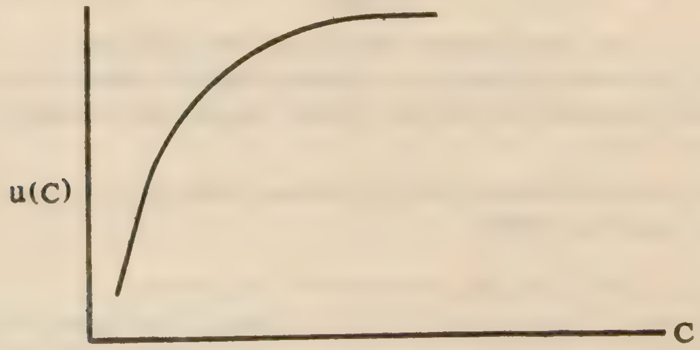

Figure 1

Also assume $F\mu>0$, $F\mu\mu=0$, $F\alpha y_O>0$, $F\alpha y_O, \alpha y_O=0$. Figure (2) shows what these restrictions imply.

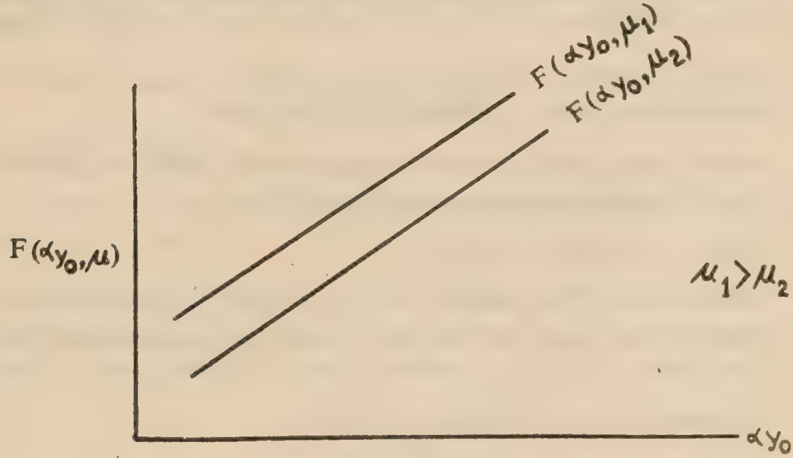

Figure 2

We can derive some easily understandable results if we simplify the problem further by assuming only two states of the world in period t_1 where the random variable takes two values μ_1 and μ_2 with probability p_1 and p_2 respectively. In that case Eq. (1) can be expressed as :

$$MU_O=(1+p)^{-1}\beta(MU_1.p_1+MU_2.p_2) \quad \cdots \quad (2)$$

where $(1-\alpha^*)y_O=C_O$

$$F(\alpha^*y_O,\ \mu_1)=C_1$$

$$F(\alpha^*y_O,\ \mu_2)=C_2$$

$$\frac{\delta u[(1-\alpha^*)y_O]}{\delta C_O}=MU_O$$

$$\frac{\delta u\left[(F_{\alpha^*y_O},\ \mu_1)\right]}{\delta C_1}=MU_1$$

$$\frac{\delta u\left[(F_{\alpha^*y_O},\ \mu_2)\right]}{\delta C_2}=MU_2$$

and as assumed earlier [Figure(2)]

$$F_{\alpha y_O}\ (\alpha^*y_O,\ \mu_1)=F_{\alpha y_O}\ (\alpha^*y_O,\ \mu_2)=\beta \text{ (say)}$$

Eq. (2) implies that in equilibrium, the individual chooses α in such a manner that he equalizes MU_O of current consumption with some adjusted value of expected marginal utility of future consumption. We can now discuss some conclusions that can be derived from the above discussions.

(1) If the individual is assured of mean future income then α will be smaller than under conditions of uncertainty.

Proof : Say $\bar{C}$ is the certainty equivalent of future consumption and C_M is the mean consumption (income). Then

$$MU_1p_1 + MU_2p_2 = MU(\bar{C})$$

and $\bar{C}<C_M$. [See figure (3)]. If instead he was assured of mean income in future, he will raise his current consumption to lower his MU_O so as to equalize it with adjusted value of $MU(C_M)$

[because $\bar{C}<C_M$, $MU(\bar{C})>MU(C_M)$].

This will imply lower value of α^*. However this effect will be partially offset by lowering of mean income as αy_O falls. But the new C_M will lie some where between earlier C_M and $\bar{C}$. α^* will be reduced to the extent C_O is raised and MU_O is lowered.

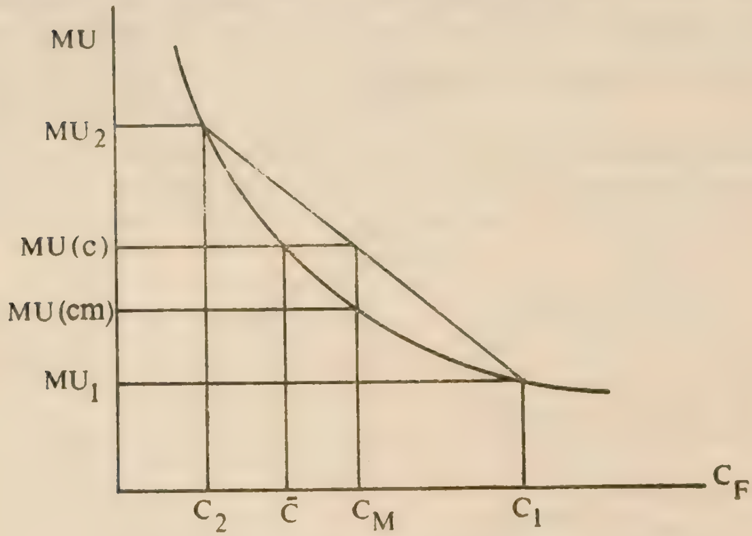

Figure 3

(2) Other things remaining constant, higher the marginal return from foregone current consumption (β), higher will be α^*.

(3) If we do comparative statics, we find $\frac{d\alpha}{dy_0}$ and $\frac{d\alpha}{d\mu}$ are both negative. Thus if y_0 or μ increases α^* falls and vice versa.

CONCLUSIONS

The model predicts that :

(1) Reduction of uncertainty of future income of parents will lead to lowering of fertility.

(2) Higher the marginal return from children higher will be the fertility.

(3) Higher the current or future income, lower will be the fertility.

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Estimating Distributional Weights For Bangladesh

by

OMAR HAIDER CHOWDHURY*

I. INTRODUCTION

That distributional considerations should play a vital role in any public policy formulation—especially in the case of developing countries is now accepted universally. But the problem remains as to how to aggregate the gains and losses of different groups of people affected by a project. Empirical estimation of welfare weights derived from a theoretical framework can help the decision makers in thinking about it in a coherent manner. It can also guide them in explicitly taking account of the equity aspect in evaluating the usefulness of a project.

The purpose of this note is mainly to illustrate how the welfare weights may be estimated empirically and to critically examine the theoretical underpinnings of the methodology applied. It is assumed that the Government attaches more weight to the gains accruing to the poorer people than to the rich. The problem is to determine at what rate the weight placed on marginal additions to income falls as income rises. Moreover if the benefit of a project accrues to the Government as well as private individuals, then we encounter an additional problem of estimating a "numeraire" or a "critical income level" or the point in income scale at which the Government would regard a marginal increase in a person's income as being as valuable as an equal increase in its own income. Hence to determine welfare weight, we need to know the weight attached to a particular level of income and the rate at which it declines as income rises. In the following section we briefly discuss the concepts of welfare weight and "numeraire" before estimating welfare weights from Government policy and consumer behaviour in section III. Finally some conclusions are drawn in Section V.

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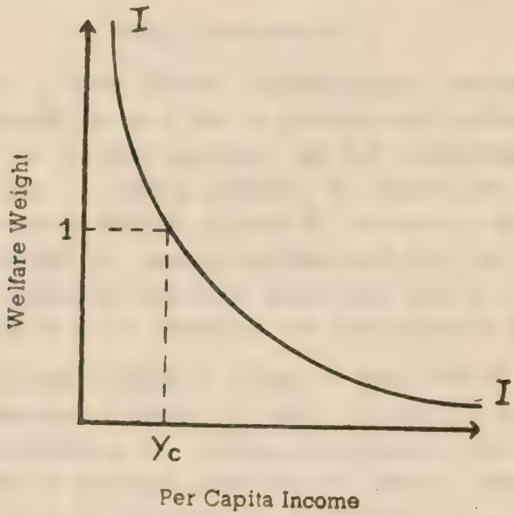
II. WELFARE WEIGHT

The assumption that the Government attaches more weight to a given income accruing to a poor person than to a rich person can be depicted by the following diagram where curve I I slopes downward to the right as income rises. y_c is the 'critical income level' such that a marginal benefit accruing to a person at this level of income is deemed to be as valuable as that accruing to the Government. Marginal benefits at this point are given the unit weight. To determine the full range of weights, we therefore need to know the slope of I I as well as the 'critical income level'.



The rate at which the weight attached to a level of income declines as income rises may be measured by the elasticity of the marginal utility of income, a higher value of the elasticity implying a faster rate of decline of the weight.

In order to estimate the values of the weights attached to increases in income let us specify the following utility function.

$$u = D - A \cdot y^{1-\eta} \qquad (1)$$

where u is utility, y is income and D and η are constants. The marginal utility of income is given by :

$$u'(y) = -A(1-\eta)\, y^{-\eta}$$

$$= k y^{-\eta} \qquad (2)$$

where $k = -A(1-\eta)$

and η is the elasticity of marginal utility with respect to income, which is assumed to be constant. These marginal utilities correspond to the weights given by the Government to marginal increases in income.

As discussed earlier, if all the benefits of a project accrue to private individuals we need only know the relative weights of their incomes. If, however, some of the benefits accure to public funds we need to know how to compare the marginal benefits to public funds with marginal benefits to individuals. In other words. we are looking for a shadow price of public funds.

Here Little-Mirrlees [3] technique of using uncommitted public funds as the numeraire may be adopted. The opportunity cost of public funds is therefore unity. Hence we can calculate k from the valuation function $u'(y) = ky^{-\eta}$ from the condition that either the marginal use or the marginal social cost of funds should have the value unity. Little and Mirrlees assumed investment to be the best marginal use of public funds. But to abstract from the complications of intergenerational analysis, we can focus on marginal cost by arguing that under the assumption of optimising behaviour by the Government, marginal social cost and value of marginal use should be equal.[1]

Then k may be estimated by putting $ky_c^{-\eta} = 1$ (2a)
where y_c is the income of the poorest person who is taxed—the critical income level. The argument is that the government is indifferent as to whether the marginal unit accrues to that person or the government itself.

Combining (2) and (2a) together, we get

$$u'(y) = \left(\frac{y}{y_c}\right)^{-\eta} \qquad \ldots \qquad (3)$$

The welfare weights (i.e., the marginal utilities) thus depend critically on the parameters y_c and η. The value of η may be estimated from both government policy and consumer behaviour. These will however be two logically distinct estimates.

Before proceeding to estimate these parameters, one should however note that eqn. (3) is derived from a utilitarian social welfare function.

[1]The shadow price of public funds may be estimated in an intertemporal framework by working out the relative valuations of investment (a possible best use of public income) and consumption. Of course it involves dynamic analysis where consequences of investment, i. e., future consumption and its valuation in relation to current consumption has to be worked out. This may be done by solving an optimal growth model for the economy concerned. See Chowdhury[1] for an application of an optimal growth model for Bangladesh.

But as Sen [4] has argued, the utilitarian welfare function is not egalitarian at all. We need a strictly concave social welfare function $W(u_1, \ldots u_n)$ in order to allow for aversion to inequality in utility levels. This will require us to estimate the contribution of an individual's income to social welfare by taking a concave transform of y to arrive at utility and then a concave transform of u to get to social welfare.

The simplest of such transformations are achieved by using a utility function of the following form :

$$u_i(y_i) = \frac{y_i^{1-\eta}}{1-\eta} \tag{4}$$

and a social welfare function of the following form

$$w(u_i, \ldots w_n) = \sum_{i=1}^{n} \frac{u_i^{1-m}}{1-m}, \text{ if } u_i\text{'s} > 0 \tag{5}$$

$$\text{or} \quad W(u_i, \ldots, w_n) = \sum_{i=1}^{n=1} -(u_i)^{m+1} \;:\; \text{if } u_i\text{'s} < 0 \tag{6}$$

where m is the elasticity of marginal social evaluation of 'utils'.

It can be easily shown that with the above specifications, welfare weights will depend on the parameter $\eta + (\eta - 1)m$ instead of η alone, as in the case of utilitarian social welfare function. In the following sections however we shall concentrate on estimating η from government policy and consumer behaviour, assuming that m is a policy parameter to be decided upon by the government.

III. DERIVATION OF η FROM GOVERNMENT POLICY

We shall assume an iso-elastic marginal utility of income function of the type $u'(Y) = kY^{-\eta}$, where $u'(Y)$ is the marginal utility of income Y, and η is the elasticity of the marginal utility of income. We shall estimate it here from government behaviour.

If the income tax structure of Bangladesh can be assumed to be based on the principle of "equal absolute sacrifice" 'then,

$$U(Y) - U(Y - T(Y)) = \text{const} \tag{7}$$

where Y = pre-tax income and

T(Y) = tax on income Y.

Now differentiating equation (7) with respect to Y we have,

$$u'(Y) - u'(Y - T(Y)) \times (1 - T'(Y)) = 0.$$

Writing $u'(Y) = ky^{-\eta}$ and taking logarithm we have,

$$-\log(1 - T'(Y)) = \eta \log \frac{(Y)}{Y - T(Y)} \quad \ldots \quad (8)$$

Equation (8) was applied to the Bangladesh tax structure of 1976 as given in Tables I and II.

TABLE I

BANGLADESH INCOME TAX STRUCTURE 1976

Income after Deducting Tax Allowance (taka)	Marginal Tax Rate %
0— 1,000	—
1,000— 2,000	5
2,000— 4,000	10
4,000— 6,500	15
6,500— 10,000	20
10,000— 15,000	25
15,000— 25,000	35
25,000— 35,000	50
35,000— 50,000	55
50,000— 70,000	60
70,000–100,000	62.5
100,000+	65

Source : The Finance Ordinance, 1976, Ordinance No. XIV of 1976 (pp. 18-19). Govt. of Bangladesh.

Marginal tax rate was applied to the middle income of each tax bracket, and the tax-free allowance was taken to be Tk. 9000.00 per annum which was the allowance for a single man in 1976.

The fit was very good with R^2 of 0.94 and $\eta = 1.73$ (significant at 1% level).[2]

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[1] Fit was good for other years as well.

TABLE II

MARGINAL TAX RATE IN BANGLADESH : 1976

Income before Tax Allowance Y (taka)	Total Tax T (Y)	Marginal Tax Rate T′ (Y)
10,000	100.00	0.05
12,000	225.00	0.10
14,250	512.50	0.15
17,250	1,050.00	0.20
21,500	2,025.00	0.25
29,000	4,400.90	0.35
39,000	8,650.00	0.50
51,500	15,275.00	0.55
69,000	25,400.00	0.60
94,000	40,775.00	0.625

Source : Calculated from the Finance Ordinance 1976, Ordinance No. XIV of 1976 (pp. 18-19), Govt. of Bangladesh.

IV. CONSUMER BEHAVIOUR

Ragnar Frisch [2], among others, has derived a formula for calculating η from consumer behaviour. He assumed a utility function with additive preferences or want independence. Want independence according to Frisch for good i and k ($i \neq k$) means that the marginal utility of good i depends on the quantity of good i, and not on the quantity of any other good. He then defines flexibility of the marginal utility the money, or η in our case, to be

$$\eta = \frac{E_i (1-\gamma_i E_i)}{B_{ii} + \gamma_i E_i} \quad \ldots \quad (9)$$

where,

E_i = income elasticity of commodity i

B_{ii} = own price elasticity of commodity i

γ_i = budget share of commodity i.

If we now assume that food enters additively in the total utility function of the consumer and that we can estimate the various parameters

of the representative food item, then we can calculate η by using the above formula. Rice is the main food item in the Bangladeshi diet and as such we shall derive the relevant parameters of rice consumption to estimate η. Income and expenditure surveys for Bangladesh provide information on per capita consumption of various food items physical terms as well as expenditure on them by various income groups. Therefore price information by income groups can easily be calculated by dividing the expenditure on each item by the quantity consumed. Per capita income can also be calculated by dividing the income of the household by the average number of people in the household. Hence the necessary information for estimating the price and income response to rice consumption in rural and urban areas of Bangladesh were calculated from the Household Expenditure Survey carried out in 1973/74 as reported in Appendix Table A. 1 and A. 2. The following functional form was used to estimate the required price and income elasticities :

$$\log Q = E \log Y + B \log P + U_t \tag{10}$$

where, Q is the quantity of rice consumed per capita and P is its price, while Y is per capita income. E and B are, respectively, the income and price elasticities and U_t is the disturbance term. Clearly consumption patterns may vary between regions (rural and urban in our case). Hence a dummy variable was introduced to equation (4) to see whether regional differences in consumption pattern are significant or not. Table 3 below reports the findings.

TABLE III

INCOME AND PRICE RESPONSE TO RICE CONSUMPTION IN BANGLADESH

Equations	Constant	Coefficient of Income	Coefficient of Price	Urban Dummy	R^2	D.F.
1	—0.347	0.744*	—0.703		0.76	22
		(0.153)	(0.689)			
2	—1.142	0.938*	—0.586	—0.274*	0.84	21
		(0.139)	(0.478)	(0.078)		

Notes ; 1. Standard errors in parentheses.
2. * denotes significant at 1% level.

The table shows that the dummy is significant and, therefore, the parameter estimates of the second equation was used for estimating η. The budget share γ of rice consumption in Bangladesh was calculated as the

proportion of expenditure in rice out of total consumption in food. It turned out to be 0.367. Thus substituting the estimated values of the variables of equation (3) we found $\eta = -2.541$.

V. CONCLUSION

We have been discussing distributional value judgements in terms of welfare weights and the welfare weight in terms of the elasticity, η, of the marginal valuation or utility of income. Our estimates suggest that the value of η should be between 1.79 and 2.54 for Bangladesh. It has further been argued that the welfare weights should not be based exclusively on η, as that would imply using on utilitarian social welfare function which is not particularly rich in egalitarianism. In fact we should estimate the contribution of an individual's income to social welfare by taking a concave transform of income Y to arrive at utility and then a concave transform of utility U to get to social welfare. As we have shown, this will mean that welfare weights should be based on the parameter $\eta+(\eta-1)m$ instead of η alone, where m may be viewed as an index of egalitarianism. What the value of m will be, is of course a matter of value judgement of the policy makers—the stronger their egalitarian values, the larger will be the value of m.

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Appendix

TABLE A.1

PER CAPITA MONTHLY CONSUMPTION AND PRICE OF RICE BY INCOME GROUPS IN RURAL BANGLADESH 1973/74

Income Groups (1)	Per Capita Income (tk.) (2)	Per Capita Consumption (seer) (3)	Price of Rice (tk) (4)
I	21.821	2.409	1.961
II	32.514	4.171	2.292
III	40.757	5.749	2.271
IV	46.917	7.241	2.373
V	56.076	8.660	2.404
VI	59.488	9.444	2.431
VII	66.597	11.055	2.440
VIII	75.603	12.399	2.504
IX	88.567	13.741	2.616
X	102.322	15.073	2.732
XI	114.543	16.355	2.758
XII	131.959	17.668	2.863
XIII	165.284	16.200	4.505

Source : Calculated from Household Expenditure Survey (HES) of Bangladesh 1973/74.

TABLE A.2

PER CAPITA MONTHLY CONSUMPTION AND PRICE OF RICE BY INCOME GROUPS IN URBAN BANGLADESH 1973/74

Income Groups (1)	Per Capita Income (tk.) (2)	Per Capita Consumption (seer) (3)	Price of Rice (tk.) (4)
I	30.000	—	—
II	42.240	6.495	2.000
III	44.924	5.270	2.179
IV	46.330	6.118	2.200
V	54.107	7.208	2.295
VI	61.099	7.626	2.359
VII	66.231	8.761	2.385
VIII	73.105	8.977	2.503
IX	91.914	10.102	2,581
X	105.288	10.487	2.686
XI	124.611	11.678	2.693
XII	153.540	11.978	2.610
XIII	213.890	12.382	3.051

Source : Calculated from the Household Expenditure Survey (HES) of Bangladesh 1973/74.

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Reviewed by : M. G. Quibria

Is There a 'Draught Power Constraint' on Bangladesh Agriculture ?

by

GERARD J. GILL*

The present paper attempts to find out whether draught power is in fact a binding constraint on raising farm output to levels indicated in the Second Five Year Plan of Bangladesh. It also addresses itself to the question of the most appropriate way of relieving such a constraint if it exists. Information was eollected from 360 farmers from five agro-ecologically distinct zones of Bangladesh, who were interviewed weekly over a period of 17 months. The study demonstrates that the supply of draught power is indeed inadequate, in quality rather than quantity, and that it is distributed unevenly, so that the constraint is severe for poorer farmers, Tractorization is not found to be an appropriate solution. Rather, better feeding of the cattle, more efficient use of existing supply by improving implements and yoking systems, and minimum tillage techniques should be encouraged.

I. INTRODUCTION

The assertion that there is a 'draught power constraint' is a very familiar one both in the literature and in discussions of Bangladesh agriculture. The argument basically concerns itself with land preparation and the prescription which usually emerges is that mechanisation should be introduced on a significant scale so as to ease this constraint and hence produce significant increases in land productivity. The present paper, which is based on the findings of a large-scale intensive study,[1] will address the following issues:

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*Presently A/D/C Associate based at the Bangladesh Agricultural Research Council. The work on which this paper is based was conducted while the author was engaged on the BADC—University of Reading project called Bangladesh Rural Mechanisation Study, which was funded by the U.K. Overseas Development Ministry/Administration. The contribution of these bodies is gratefully acknoledged, but the views expressed herein are entirely the author's and do not necessarily reflect those of the sponsoring agencies or of any other organisation named herein.

[1]For the full report, see Gill [18].

is there a draught power constraint in Bangladesh, and if so what is its nature and how can it best be eased, given the country's resource endowment and aspirations? First, however, it is worth pausing briefly to ask what is meant by a 'constraint' in this context, since it is a question which does not always appear to have been asked before prescriptions are formulated.

A constraint is of course meaningful only in relation to the goals whose achievement it impairs. Three major goals on which the farm mechanisation debate impinges are articulated in the Second Five Year Plan.[2] The first is "to accelerate food production beyond self-sufficiency in the shortest possible time". In the absence of significant areas of new lands which can be brought under the plough, this basically means increased land productivity. The second goal is "to expand opportunities for gainful employment, beyond the growth of (the) labour force so that people have access to resources for their own basic needs". And the third is, "to attain a higher degree of self reliance". Insufficiency of draught power, insofar as it exists, will constrain achievement of the first of these goals, but certain methods of easing such a constraint may in turn constrain realisation of the others. For example, tractorisation could conceivably increase draught power availability, but at the expense of causing unemployment and an increased dependency on imported technology, hence constraining goals 2 and 3 above.

Just as there can be such trade-offs among goals, there may also be trade-offs between alternative approaches to easing constraints. There are many constraints on increasing land productivity in Bangladesh, of which an insufficiency of draught power may, or may not, be one. With an average application of only 20 *seers* of fertiliser per acre per annum, there is a fairly obvious fertiliser constraint and with just 40 per cent of the "realisable 1985 target" irrigable area actually under irrigation, it would be difficult to deny that there is an irrigation constraint [4, Chapter XII]. All such constrints press on the same scarce resources (capital, foreign exchange, etc.). More tractor ploughing means less fertiliser, while diesel used in power tillers is thereby lost to irrigation. In any part of an economy as long as returns to investment are positive, it is possible to speak loosely of a 'constraint', but scarce resources with high opportunity cost must be invested where returns are maximised, not merely positive. The opportunity cost of switching foreign exchange resources from fertiliser and irrigation to mechanisation of land preparation will be quantified later in the present paper.

A first cousin to the loosely defined 'constraint' is the unnecessary 'package'. Mechanised land preparation is on occasions advocated as an integral part of a

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[2] [4, Chapter II, p. 1].

'package' of improved inputs and practices which is allegedly required in its entirety to achieve any significant breakthrough in land productivity. The 'package' concept gained widespread currency in the vocabulary of agricultural development early in the 'green revolution', when it was demonstrated that without an integrated set of investments in fertiliser and water supply, as well as in seeds, it was not possible to realise more than a fraction of the potential of the new high-yielding grain varieties. Fertiliser and assured water supplies together with improved high yielding varieties constitute a 'package' precisely because these varieties were designed to be responsive to these particular inputs. Without them they generally perform less well than traditional varieties. However unless mechanised land preparation *per se* makes a similarly *qualitative* contribution to land productivity, it cannot be regarded as part of a 'package'. Its effect will at best be additive.

In the cases of the employment and self-reliance goals assertions which have not been tested empirically in a Bangladesh setting have become almost as familiar as the 'draught power constraint' argument. While no-one seriously denies that mechanisation of land preparation causes unemployment directly, it is argued that there is also an offsetting job creation effect in that increased land productivity should produce a concomitant increase in the demand for labour to plant, harvest and process the increased volume of farm production. Hence, it is argued, the *net* employment effect of tractorisation may quite easily be positive. Moreover if land is no longer required for the provision of fodder for draught animals, food production and employment can further be increased. Finally it is alleged that if food self-sufficiency is achieved through easing the 'draught power constraint' the overall net effect on self-reliance will have been positive, despite the increased reliance on import-dependent technology. It will readily be appreciated that all of the above arguments on employment and self-reliance are predicated on the assumption of increased agricultural production consequent upon tractorisation. If this does not occur, then clearly neither will these indirect benefits materialise.

The study reported here set out to examine the above hypotheses under farmers' field conditions in the world's most densely populated agriculturally biased economy. It included both four-wheel tractors and two-wheel tractors (power tillers) and was conducted in five agro-ecologically distinct parts of Bangladesh, ranging from the Northwest to the South. Over a period of 17 months weekly interviews were conducted with the same panel of 360 randomly selected farmers, which sample included 'mechanised' and 'nonmechanised' holdings. Thus a total of more than 20,000 individual interviews were conducted. The enumerators were village-resident and interviews were supplemented with

direct observations, measurements, crop cuts, timings, etc. Detailed cropping histories of the more than 3,000 plots which comprised the sample holdings were constructed, including day-by-day timing of operations and detailed recording of inputs and output (including the crop cuts). Diet sheets of farm animals were similarly maintained. An extensive range of checks was devised to monitor the data collection process for reliability and internal consistency. Supplementary interviews were conducted with tractor and, more especially, power tiller owners in other parts of the country.[3] Throughout the following discussion, the terms 'tractor' and 'tractorisation' should be taken to include both large 4-wheel tractors and 2-wheel power tillers. The distinction will be made explicit wherever this is appropriate.

II. TRACTORISATION AND LAND PRODUCTIVITY

The introduction of tractors to replace bullocks can in theory improve the quality of land preparation in two ways. First by deeper and/or more thorough tillage, weed destruction can be enhanced and organic material more thoroughly incorporated with the soil so that vigorous crop growth is encouraged and yields consequently improved. Second, cultivation may for two reasons be more timely : (a) the greater draught power of the machine can sometimes enable cultivation to proceed before the rains, so that the crop may be sown earlier than would otherewise be possible; (b) because the machine operates faster than bullocks and because it is capable of a much longer working day it can cultivate a greater land area in a given period of time. Timely cultivation can ofcourse play a crucial role in efforts to increase cropping intensities. It must be stressed however that the above advantages must for the moment be treated as purely theoretical.

Turning first to the question of yields, some experimental work has been done on the response of paddy to cultivation by power tillers in Bangladesh. A small scale study in Bogra suggests that other things being equal, power tiller cultivation did in a single experiment increase yields by between 4 and 6.5 per cent compared with the best animal draught treatment. More extensive work at the Bangladesh Rice Research Institute (BRRI), however, conclude that replacing bullocks with power tillers does not significantly affect yields of transplanted aman, aus or boro. Nor did the BRRI trials find any significant difference in weed infestation comparing animal cultivation with power tiller

[3]For more detailed discussion see Gill [18], Chapter 1 and Appendices 3 to 6.

cultivation.[4] Thus under experiment station conditions the contribution of tractorisation to yields has been at best quite meagreemcompared for example with the doubling or tripling of yields that can be achieved with fertilisers, HYV seed and water control. Moreover under these conditions, high cash inputs are performing under relatively favourable conditions, since the constraints faced by the farmers do not apply (see below). The results of the present study indicate that *under farmers' fiield conditions* there were no significant[5] differences in yields comparing tractorised and animal powered methods of cultivation after controlling for such factors as fertiliser and planting date. This finding is in line with those of a large number of studies across the South Asian subcontinent, again at farmers' field level [11].

The second question to be investigated was whether under field conditions tractorised mehods are significantly more timely than animal powered cultivation. Two situations were considered, both requiring fast operation. First the turnround period between successive crops especially *aus* to *t-aman* paddy, and second the seeding of the first crop after recession of the monsoon floods. In no case was the turnround period on tractor/power tiller cultivated plots significantly shorter than on those cultivated by bullocks, and in no case were the engine-cultivated plots seeded significantly earlier.

There are several reasons for this failure to realise potential time-saving (and much lesser potential, yield) advantage. The first concerns fixed cost, as will be illustrated in the case of power tillers. The last time they were sold to the public in Bangladesh, power tillers cost Tk. 28,800/- each,[6] which was about ten times the capital cost of a pair of draught animals. Hence the power tiller must cultivate ten times as large an area in order to justify its capital cost, a factor which clearly makes great inroads into its time-saving (and any small

[4]John Harrop FAO-BARI Winter Crops Project (pers. comm.) and Bangladesh Rice Research Institute [8; 9; 10].

[5]In this as in all cases in the present paper 'significant' means statistically significant at the 5 per cent level or better.

[6]The price charged by BKB when these machines were sold in 1977 was Tk. 28,200/- which was the c. & f. price plus 15% duty plus 8% handling charge. Were the same machines now to be imported on a commercial basis they would cost around Taka 50,000/-. The difference is due to (a) increased c.i.f. charges, (b) revaluation of the yen against the taka, (c) applying the market (wage-earners) rate of exchange instead of the (overvalued) official one and (d) higher handling charges and markup (Data supplied by BKB and Yanmar agents). An IRRI-type power tiller of 40% less horsepower is now under construction at the Bangladesh Machine Tools Factory. It will cost Taka 32,000/-, but its performance under actual farm conditions has yet to be evaluated.

potential yield) advantage. Second, since the power tiller must cover this larger area, its travelling time will increase proportionately, thus reducing the amount of time available for cultivation. Third, it is very difficult to keep complex machinery in remote parts of the country properly fueled, lubricated, and serviced and break-downs are more frequent than they would otherwise be. Unfortunately, when such break-downs do occur it tends to be when the machine is under greatest stress i.e., during the peak cultivation season, and since both spare parts and competent mechanics are in extremely scarce supply, delays in getting the machine operational again are lengthy.[7]

All that has just been said of privately owned power tillers can be repeated, but much more emphatically, of the(government) tractor-hire service.Compared with power tillers, two- axle tractors are very much more expensive and must therefore cultivate a very much larger area to meet fixed costs; the distances travelled are greater; the working day is shorter and the problems of maintenance even more severe, given bureaucratic procedures and delays. Generally speaking these large tractors are quite unsuited to the small, fragmented and widely scattered plots which typify tenurial patterns in Bangladesh.

Given the above findings, it is hardly surprising that analysis of plot histories showed that cropping intensities were no greater on machine-cultivated plots or on tractor-using farms than on others. There is only one change in patterns of production which can unequivocally be associated with mechanised cultivation, and that is a substitution of potato for other *rabi* crops. Generally speaking this is a high input, high value crop, a 'rich man's' crop, but it is certainly possible to grow it, even on a commercial scale, without tractor cultivation in Bangladesh, since many farmers do so. This point will be taken up again later.

The argument that tractorisation will increase food availability through releasing land from supporting draught animals can be disposed of fairly readily. Analysis of feeding patterns shows clearly that land is not set aside to provide fodder for these animals in Bangldesh: they are fed exclusively on weeds, rough grazing and crop residues, mainly rice straw. Such feed could be used only *indirectly* in food production, i.e., fed to other livestock, but this would produce only very limited quantities of expenisive animal protein, not the foodgrains, pulses etc. upon which the large, undernourished segment of the population perforce relies. More to the point, perhaps, as will te demonstrated later, the opportunity cost of mechanising land preparation are very high in terms of sacrifice of the potential to increase production through increased input supply.

[7]All of the power tillers in the present sample had experienced breakdowns in the current season which had put them out of commission for periods ranging from two days to ten months.

III. TRACTORISATION AND EMPLOYMENT

Direct Effects

Since on the evidence the introduction of mechanised land preparation in Bangladesh has not in fact led to increased yields or cropping intensities, the argument that it makes a qualitative, rather than a quantitative, contribution to land productivity cannot be sustained. Hence the 'package' argument outlined earlier does not apply to this particular innovation and there is consequently no job-creation effect to set against any labour displacement which may be caused. Agricultural labour in Bangladesh, as in most countries, comprises two basic types, casual and permanent. Almost all of the wage labour is hired on a casual basis; fewer than one farmer in five had any permanent or long term employee in the study sample and overall this latter type of worker constitutes only nine per cent of the permanent farm labour force. The bulk of the permanent labour force comprises members of the farm family. Both casual and family labour can be displaced by mechanisation but the most immediate impact falls on casual labourers to the extent that mechanisation reduces labour requirements for a task which traditionally provided them with employment.

Table I shows the relative importance of various farm operations in terms of the demand for casual labour which they generate. Harvesting and weeding are clearly the most important tasks from this viewpoint, each providing about a quarter of total demand. Transplanting is almost as important in areas where transplanted paddy is grown. Casual labour requirements for land preparation fall a long way behind these figures and even the 10.5 per cent given overstates the true 'need' for this type of labour. Labour for land preparation is typically hired as part of the complete ploughing team. this is partly because animals respond best to a particular ploughman whom they know and partly because the owners of the animals do not wish to run the risk of their being maltreated by a stranger. Thus a small farmer may be forced to hire labour as the price of having to hire bullocks.

The decision to hire casual labour is clearly the outcome of a multitude of technical, economic, social, religious etc. circumstances and of personal (leisure) preferences. A few of these can be quantified in a study such as this and Table II presents the results of the multiple regression analysis. The equation for overall casual labour demand does not show any significant effect of tractor use, but when the figures are disaggregated some significant differences do arise. First, as the second equation shows, tractor use correlates negatively with casual labour hired for land preparation, with the tractor users hiring on average 3½ fewer

man days per acre for cultivation than the non-users. Moreover when the figures for the power tiller areas, where mechanised land preparation has had by far the greater impact, are separated out from the government tractor hire service areas, the direct labour displacement effects incrase by 30 per cent.

In no area was labour demand for weeding found to be reduced by tractor use, a finding which challenges the argument that tractors improve the standard of tillage *under field conditions* in Bangladesh. This finding is supported by the BRRI experiment station trials which were quoted earlier.

TABLE I

RELATIVE IMPORTANCE OF FARM OPERATIONS FOR CASUAL EMPLOYMENT

OPERATION	MEAN	RANGE		
Land Improvement	7.3	1.6	—	10.7
Land Preparation	10.5	7.7	—	23.2
Planting & Sowing	4.0	0.0	—	7.1
Transplanting	16.4 (22.0)	1.9	—	32.9
Fertilizer/Manure Application	8.8	0.0	—	2.4
Weeding	24.5	13.1	—	36.0
Irrigation and Drainage	1.6	0.2	—	5.4
Harvesting	26.1	15.4	—	30.7
Crop Processing	6.1	1.2	—	8.6
Transportation & Marketing	1.3	0.1	—	4.4
Animal Husbandry	0.4	0.0	—	1.2
Other	1.1	0.4	—	2.7
	100.0			

Notes : Each figure in the MEAN column is the percentage of the total number of man-days of casual hired labour devoted to the task in question (overall sample). The figure under RANGE show the minimum and maximum such percentages recorded for any of the sampling areas.

The figure in parentheses omits one sampling area where neither *t. aus* nor *t. amun* are grown and other transplanted crops are relatively unimportant.

The fact that labour requirements for harvesting seem to be slightly higher on tractor using farms then others is interesting. If tractorisation had produced significantly higher yields or cropping intensities this would be understandable, but the evidence shows no such production effect. When the multiple regression was re-run on disaggregated data the coefficient in question was found to be significant

TABLE II

DETERMINANTS OF DEMAND FOR CASUAL LABOUR (n=360)

Regression Equation								F	R	Signif (%)
1) La=34.4	— 6.8P	—1.7A	—0.2S	+ 0.109I	+ 0.85C			10.5	0.13	0.1
	(4.2)	(0.7)	(0.1)	(4.6)	(0.75)			(46.1)		
2) Lp=7.7	— 3.5T	+ 2.6P	22.8H	— 3.5A	— 0.06S	+ 0.03I	+ 0.09C	8.8	0.15	0.1
	(1.6)	(1.3)	(4.0)	(1.6)	(0.03)	(1.4)	(0.05)	(13.7)		
3) Lw=7.9	+ 0.29C							33.7	0.09	0.1
	(0.05)							(16.0)		
4) Lh=8.1	+ 2.9T	+ 2r4P	— 0.07S	+ 0.019I	+ 0.05C			8.6	0.13	0.1
	(1.1)	(0.8)	(0.02)	(0.9)	(0.03)			(8.3)		

Notes. Dependent Variable (L)=no of man-equivalent days of casual labour hired/acre annum.

Subscripts: a=all tasks; p=land preparation w=weeding; h=harvesting and crop processing.

Independent variable : P=permanent labour (Man equivalents/acre) ;

A=Total operated acreage ;

S=Percentage of land Sharecropped in;

I=Cropping Intensity (%);

C=Percentage of acreage under labour-intensive crops;

T=Tractor user Status (1=user 0=non-user);

H=Installed horsepower per acre;

Figures in parentheses are standard errors of estimate.

All coefficients are significant at the 5% level or better.

only in one of the sample areas and that the one with the lowest tractor penetration, Comilla. It can only be assumed, therefore, that a third variable which correlates with both tractor use and harvesting labour demand explains the apparent relationship. The Comilla sample was closer to a town than any of the others, so it could be that leisure preference is the variable in question: i.e., those sufficiently rich and influential to obtain a tractor from the hire service also have important affairs in town which reduce their own labour inputs and therefore necessitate substitutes at least during the busiest season, harvesting.

Before leaving this theme it is instructive to return to the special crop mentioned earlier, potato. When land preparation for this crop is mechanised there is a very marked drop in labour requirements. This is because the traditional technique of potato cultivation is to employ large gangs of labourers using long-handled mallets to smash the clods left by the plough. This together with the intensive ploughing that is traditionally practised for potato, means that it is an unusually labour intensive crop during the cultivation seasons. The study findings show that a single power tiller will displace no less than 3,000 man-days per annum of land-preparation labour if it is used exclusively for potato. This certainly explains the popularity of engine cultivation among potato growers and also the evident shift from other *rabi* crops to potato when tractors are available It is wise to stress, however, that the above labour displacement effect would occur only when land which previously grew potato under traditional methods was tractorised. When tractorisation induces a switch to potato from competing *rabi* crops such as mustard or wheat, the labour displacement effect is very much less because land preparation for these crops is typically much less thorough.[8]

Space limitations preclude any detailed comment on the other coefficients shown in Table II, but a few brief observations may be helpful. First, supporting what was said earlier, there is a marked negative correlation between installed horsepower per acre and labour hired for cultivation. Second, labour demand clearly correlates positively with cropping intensities and with the incidence of certain crops (the most important being HYV paddy). Third, the incidence of sharecropping clearly correlates negatively with the demand for casual labour, which is precisely what economic theory predicts. Finally the relationships involving farm size and permanent labour force are very important. The fact that demand for casual labour correlates negatively witht the size of the per manent farm labour force is naturally to be expected since they are mutual substitutes. What is most important, however, is that when this factor is

[8]The use of a mallet to smash clods is not limited to potato, but it is a crop for which cultivation standards are unusually high.

controlled for, as in Table II, farm size is found to correlate negatively with per acre casual labour demand, so that the larger the farm the less labour intensive is its mode of production. Under these circumstances, any tendency for average farm size to grow is likely to be accompanied by a decrease in labour intensity. And average farm size *does* tend to grew with tractorisation, as will now be demonstrated.

Indirect Effects

Marginal and sub-marginal farmers in Bangladesh 'top-up' their income from the small holding with paid employment, usually by working for neighbouring large farmers. Thus any direct labour displacement effect arising from mechanisation (which tends to occur on larger holdings) will adversely affect the earnings of this group—particularly those among them who hire out surplus ploughing capacity. The major threat to smallholders from mechanisation is however an indirect one and will arise if mechanised farms expand at small holders' expense,

There is clear evidence that tractor users tend to be the larger farmers. In the present study for example the average size of a 4-wheell tractor using farm was five acres compared with three acres for bullock farms. Power tiller users were found to farm on average almost twice as much land (4 acres against 2.1) as the bullcok farmers. The power tiller owners' farms were larger still, averaging 7.7 acres (All differences were statistically significant).

The fact that tractorisation tends to be associated with relatively large operated acreages does not of course demonstrate causality, but further investigation of this relationship has in fact done so. Power tiller owners were interviewed in Dhaka, Jessore and Sylhet Districts and in each area it was found that the acrege operated by at least some of the tractor owning farms had increased subsequents to and, according to the owners, as a result of, thier acquiring these machines. In every such case the reason given was that by reducing labour requirements management constraints were also reduced and the scale of operations could therefore be expanded. The methods used to increase the size of holding were four in number: (a) Failing to renew a lease on its expiry; (b) Renting in additional land; (c) Land purchase and (d) Mortgaging in of others' land. By these methods holdings had been increased by proportions ranging from 28 to 92 per cent. All of the power tiller owners in the sample increased their operated acreages because they had acquired these machines.

IV. COSTS AND SUBSIDIES

A power tiller, given the conditions under which they were last sold, is an extremely profitable investment for those few farmers who can obtain one. The

payback period is less than one year, the benefit-cost ratio 2.09 and the net present value 113 thousand taka ($15\frac{1}{2}\%$ discount rate). The internal rate of return is 254 per cent—it is higher than the interest rates charged by village money lenders ! However the prices of both machine and fuel contain many elements of subsidy and/or concession. These include an overvalued exchange rate and a highly concessionary rate of duty on both machine and fuel. None of these benefits are passed on to hirers of the power tiller, who pay approximately the same hire charges as they do for draught animals (to achieve a given standard of cultivation). A cartel of power tiller owners maintains this level of charges.

If the various subsidies and concessions were removed, the purchase price of the power tiller would be more than doubled and running costs would also increase very sharply. The payback period becomes nearly two years, the benefit-cost ratio at the same rate of discount falls to 1.33, the net present value to 52 thousand taka and the internal rate of return to 48 per cent. This is still a very profitable investment, a fact which shows that even if a decision is taken to encourage such mechanisation, there is no need whatever for the taxpayer to provide subsidies or other concessions. A *laissez faire* approach would indicate selling them to the highest bidder.

Opportunity Costs of Mechanised Land Preparation

It has been shown that tractorised land preparation where it has occurred under the operating conditions presently obtaining in Bangladesh has done virtually nothing to increase land productivity, but has demonstrated a capacity for labour displacement, both direct and indirect. As Table 1 shows, land preparation is not as important a task in terms of employment opportunity as transplanting, weeding or harvesting. If these tasks were in their turn to be mechanised to any significant extent the effects on employment could be quite catastrophic.

Tractorised land preparation consumes scarce resources: foreign exchange for machinery, spares, fuel and lubricants, storage facilities, transportation resources to move these commodities to where they are needed, and mechanical engineering skills to service and repair the equipment. Nor would these costs be diminished substantially were the machines in question to be manufactured domestically. The import component of such technological innovation would remain high, while fuel and lubricant requirements would still have to be imported. The opportunity cost would, as was noted earlier, manifest itself in the shape of reduced potential for intensified farming through investment in seeds, fertilizers, irrigation facilities, etc. Hence the potential for an associated increase in

agricultural employment would also be sacrificed, since fertiliser, improved seed and irrigation, unlike tractors, do increase production and hence generate demand for additional labour.[9] Moreover since seed and fertilizer are neutral to scale they do not confer any of the management economies which in the case of tractorisation have been shown to lead to the displacement of smallholders. Paradoxically the fact that crop yields and cropping intensities in Bangladesh are low by the standards of other South and Southeast Asian nations gives grounds for guarded optimism that there exists a potential for achieving marked increases in agricultural production and hence employment. Returns to known technological innovations will be relatively high, provided existing constraints can be overcome.

The Draft Second Five Year Plan implies that the current shortfall in animal draught power is in the order of twenty per cent. If this shortfall were to be made up with power tillers (the Draft does *not* say it should be), this would require, according to the findings of the present study, almost 50 thousand additional such machines, i.e., a more than ten-fold increase. These power tillers would cost as much as 800 thousand tons of wheat (which is 25 per cent more than the total amount commercially purchased by Bangladesh in 1980).[10]

Land productivity would not, however, be increased, nor would the goal of attaining a higher degree of self reliance be served, by importing foodstuffs. The true opportunity cost of tractorisation is the sacrifice of the above mentioned agricultural inputs, which could have been purchased with the foreign exchange and other resources in question.[11] Brammer [13, p. 19] has shown that one maund of balanced fertilisers will produce at least 3½ maunds of additional rice under present day farmers' field conditions in Bangladesh. Thus if the foreign exchange required to purchase 50,000 power tillers were spent in stead on fertilisers which were in turn used on paddy., it would generate as much rice as would feed ten million people for a year. The annual diesel requirement of these machines alone could, by the same argument, produce sufficient rice to meet over two-thirds of Dhaka city's consumption for a year.

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[9]For estimates of the relevant elasticities. see Clay [14] and Clay and Khan [15].

[10]Details of opportunity cost calculations appear in the Appendix.

[11]Needless to say these examples are illustrative rather than definitive. However that the opportunity costs are real is supported by a number of studies. For example, a recent one by the World Bank which identified a chronic insufficiency of diesel fuel supply for pumps, and fertiliser demand progressively outstripping supply as major constraints on agricultural productivity [19, pp. 27-31 and 34 respectively].

In the case of irrigation, the opportunity costs impinge even more directly since both tractors and pumpsets require diesel fuel which is often in scarce supply in the countryside during the irrigation season. Recent measurements in rural Bangladesh imply that at the farmers' field level one gallon of diesel fuel used in a shallow tubewell will produce 4 maunds of paddy. Thus the annual fuel requirements of one power tiller could produce almost 2,000 maunds (84 tonnes) of paddy and the annual fuel requirements of the above fleet of 50,000 power tillers would produce an additional 4.2 million tonnes of paddy. This last figure would represent a 30 per cent increase over present levels of production, more than sufficient to wipe out the presently estimated 12 per cent shortfall in aggregate grain production [4, p. XII-75]. This is not, of course, to argue that food self-sufficiency is to be achieved simply by pouring in more diesel. It does, however, help illustrate the order of magnitude of the opportunity costs under consideration.

V. CONCLUSIONS

To argue that scarce resources are best invested elsewhere than in mechanising land preparation is not to imply that there is no 'draught power constraint' in Bangladesh today, or that other, relatively plentiful, resources cannot profitably be invested in this area. The number of draught animals is adequate to meet requirements (3.8 acres per pair against a rule of thumb of 4 or 5 acres). It is the quality of the animals, or more precisely, the quantity of their feed, that is deficient. Another problem is unequal distribution: as many as a third of the sample farmers had no draught animals, while a further tenth had only one. The former group at least, often do face a draught power constraint because they get their animals late and charges are high. The present study has, however, shown quite clearly that tractorisation benefits only the larger farmer and therefore does not directly address this particular constraint. Nor was any evidence uncovered which would indicate that smaller, disadvantaged farmers were in fact benefitted by the government tractor hire service. Any future interventionist scheme would have to take this experience into account. But whether or not an interventionist approach is adopted, measures are clearly required to improve the overall supply of animal draught power in relation to demand. This may be achieved by increasing the former and/or reducing the latter.

Increased supply depends primarily on improved nutrition. Bangladesh is now, again perhaps paradoxically, in a position in which after a secular decline caused by pasture land coming under the plough to grow food for human, the animal feed position can now begin to improve. This is true for two reasons.

First, any further increase in food production must now come through intensification of agriculture, which implies that production of crop residues as well as crops will tend to increase. Second, new methods are being discovered of treating low grade crop residues such as paddy straw (including HYV straw) to make them more nutritious for animals. This treatment is inexpensive and simple—e.g., urea, or even urine, treatment of straw—and has successfully been tried out in the villages in Bangladesh.[12] Thus as increase in the supply of animal draught power in the order of twenty per cent should not be unduly difficult to achieve. Further experimental work of this kind deserves every encouragement.

In addition to increasing the supply of animal draught, ways can be found to reduce the demand. An example is zero and minimum tillage techniques: preliminary experiments at the Bangladesh Rice Research Institute have shown encouraging results. Another such approach is to utilise existing draught resource more efficiently by design improvements to implements and yoking systems. A simple inexpensive ox-collar or some other alternative to the present yoking system is a clear priority.

An increase in the aggregate supply of draught power relative to demand should benefit smaller farmers, those without draught animals, in two ways. First, since the existing animals will be better fed they will complete the work on their owners' farms earlier and hence come on to the hire market earlier. Second, an increase in supply relative to demand should result in falling prices. This is more likely to occur in the case of animals than power tillers, since there being many suppliers of animal draught it would be correspondingly more difficult for them to do what the power tiller owners have done and form a cartel to keep profits high. This need not rule out an additional interventionist approach, such as supplying drught animals to smaller farmers or farmers' groups, but the latter would not easily be implemented, given the economic and social influence of some of the larger farmers and the fact that crop residues are in short supply on smaller farms. The institutional base for such an approach would have to be very solid indeed. The same type of argument applies to any projected attempt to divert supplies of animal draught towards those parts of the country where it is in unusually short supply.

[12]For details see Dolberg [16] Khan and Davis [24] Saadullah, Haque and Dolberg [28] and Sayeed and Davis [29].

Appendix

OPPORTUNITY COST CALCULATIONS

Foodgrain Imports

In the most recent year for which data are available (1979/80), Yanmar power tillers—the type covered in the Survey and by far the most common in use in Bangladesh—cost Tk. 35,000/- c.i.f. Chittagong (data supplied by Yanmar's agent). In the same year the c.i.f. (Chittagong) price of wheat averaged Tk. 2,115/- per tonne [6, Table 8, 11].

Fertiliser Imports

Per capita foodgain consumption is presently estimated to average 15.4 ounces per day [4, p. III-9], which is equivalent to 160 kg. per annum. Given a fertilizer use efficiency, quoted in the text, of 3.5:1 (kg. rice/kg. fertilizer), one tonne of balanced fertiliser will produce sufficient rice for 22 people for a year, at present rates of consumption.

In the year that power tillers cost Tk. 35,000/- (see above), c.i.f. Chittagong fertiliser prices per tonne averaged Tk. 3,910/- (TSP), Tk. 3,482/- (Urea) and Tk. 3,427/- (MoP),so that one power tiller cost about the same as 9.6 tonnes of balanced fertiliser. This would provide enough rice for 210 people for a year and 50,000 power tillers would cost as much fertiliser as would produce rice for 10.6 million people for a year.

Rather more recent prices are available in the case of diesel fuel and lubricants. In 1980/81 the price of diesel averaged Tk. 17.44 per imperial gallon (IG) c.i.f. Chittagong and that of high viscosity index oil Tk. 34.06 per IG. At the average consumption rates found in the present study (550 gal. diesel and 16.5 gal. oil per annum) the annual foreign exchange cost of one power tiller is equivalent to two tonnes of the most expensive fertiliser at the then current prices. The fuel for 50,000 power tillers would thus 'cost' 100,000 tonnes of fertiliser, hence 350,000 tonnes of rice, which is sufficient at the above consumtion levels for 2.2 million people for a year.

Diesel Fuel for Irrigation

Command areas for below—perhaps averaging 50 per cent less than designed

capacity has long been recognised as a major constraint on development of the irrigated sector in Bangladesh. One such problem, the often acute scarcity of diesel fuel in peak periods, has been pinpointed in the text. If current efforts aimed at easing other constraints on demand area development are successful, more pumping hours and hence more diesel fuel will be required. Hence the 'diesel for irrigation' constraint is a very real one.

The figures used here are based on the shallow tubewell's average fuel consumption of 0.3 gallons/hour and pumping capacity of 0.75 cusecs (Ahmed [1]). Thus one gallon of diesel will allow the pump to operate for 3 hours, 20 minutes (12,000 seconds) during which time it will deliver 9,000 cu. ft. (255 m^3) of water. Calculations based on Biswas and Mandal [12, p. 97] show that under farmer's field conditions in Bangladesh water use efficiency (WUE) ranges from 0.5 to 0.7 kg. paddy per cubic metre of water. Hence an additional 255 m^3 water can be expected to produce an additional 125-180 kg. paddy, say 153 kg. (4 maunds) on average. Thus the 550 gallons annual fuel requirements of one power tiller would be capable of pumping 140,000 cubic metres of water which would produce 84 tonnes of paddy (yielding sufficient clean rice for 350 people for a year). Multiplying this figure by 50,000 power tillers gives 4.2 million tonnes of paddy.

It is worth noting that the above WUE coefficient is low in relation to technical possibilities. Studies on experiment stations in Bangladesh show that under these conditions WUE can rise to 3.35 kg. grain/m^3 water with fertiliser and improved seed, figures which are comparable with findings elsewhere in Asia.[13] Hence the interaction effect of water, improved seed and fertiliser, which have not been taken into account in the above calculations, should further increase the value of such investments—and hence the opportunity costs of switching the necessary foreign exchange to power tillers—even more.

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A Macro-Econometric Model of Bangladesh

by

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A short-run macro-econometric model for Bangladesh has been developed in this paper combining the elements of both demand-based and supply-bottleneck models. The parameter estimates have been derived using data for the period 1960-1979 (excluding 1971). Tests of significance of the estimated co-efficients seem to validate the model. Historical simulation also revealed that the model is capable of broadly explaining the workings of the Bangladesh economy. Since no policy simulation was carried out, no definitive conclusions can be reached at this stage about the policy implications of the model. Nevertheless, some tentative conclusions have been drawn on the basis of the signs and magnitudes of estimated co-efficients.

I. INTRODUCTION

In 1965 Lawrence Klein posed the question, what kind of models should be employed for the developing countries. In the words of one recent commentator [32, p. 509], the question "is still an open one despite some serious attempts..."

The theoretical foundations of some of the models formulated for developing countries have been provided by Harrod Domar aggregate growth models, static and dynamic linear-programming models and Chenery type two-gap models.[1] Assumptions which underlie the construction of these models include: (i) the level of aggregate demand and the degree of capacity utilization do not matter; (ii) there is very limited short-run flexibility due to low elasticities of substitution on the one hand and very low short-run response to price change on the other; (iii) financial constraints on government and central bank behaviour can

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[1]Examples include [9 ; 11 ; 17 ; 43].

safely be ignored. The resulting models therefore include only real phenomena and are characterized by supply bottlenecks.

While it is undoubtedly true that a dominant feature of developing countries is their comparative overall productive backwardness, this does not mean that they have no short-run problem of aggregate demand. The existence of considerable under-utilized capacity is now generally recognised [44]. Partial-equilibrium econometric estimates which have been made imply significantly non-zero elasticities of substitution and price responses for a number of developing economies.[2] In view of this, Blitzer *et al.* [9] have emphasized the need to incorporate shortrun features in macro-economic models formulated for developing countries.

In recognition of the importance of the short-run, a number of Keynesian models have been constructed for developing countries.[3] Unfortunately, however, the structures of these models have been transplanted from aggregate-demand models of developed economies with little or no adjustment for the special conditions in the developing countries. Hence, numerous shortcomings in the resulting specifications are observed.

In these demand-oriented models, national income is determined by aggregate demand. Thus the possibility of capacity constraints on the supply side is ignored. The importance of the foreign sector as a source of non-competitive intermediate and capital goods imports is not articulated properly. The importance, due to fragmented and poorly functioning capital markets, of direct flow and of retained earnings in the real investment process is not explored. The possible impact of quantitative restrictions, which are widely utilized in developing countries, is not examined.

The models of developing countries that are used as a basis for policy making reflect economists' changing perceptions of the basic characteristics of developing countries. An attempt is made in this study to specify a model for Bangladesh which overcomes the shortcomings frequently encountered in supply-determined and Keynesian models of developing countries. Elements of both types of models are incorporated with the belief that greater realism will be obtained.

It is important to note that the model constructed here is a short-term macro-economic model and not a long-term planning model. Hence, in contrast to multisector inter-industry planning models which divide the economy into a

[2]See [30].

[3]See, for example, [7; 8; 29].

number of explicit producing sectors, our macro-economic model treats the whole economy as one producing sector and is oriented toward forecasts of the major national accounts aggregates. Not being a planning model, our model does not yield alternative growth paths and the question of selecting an "optimal" growth pattern does not arise. Rather its usefulness lies in the fact that it throws light on the workings of the Bangladesh economy and can be used for policy purposes to indicate the impact of policy changes on key macro-economic variables.

II. STRUCTURE OF THE MODEL

The model is structured in five blocks, the first of which contains the expenditure equations. The production equations are developed in the second block. The third block specifies the monetary sector. The fourth block contains the government sector while the fifth block presents the foreign trade sector.

In a Wicksell-Keynes-Patinkin type model the interaction between the real and monetary sectors of the economy is two-fold : first, through the rate of interest which is an argument in the demand functions for money and commodities, and second, through the real-wealth effect. In our model this mechanism deviates from that described above for two reasons. Firstly, although the rate of interest may influence decisions related to the capital stock that producers wish to hold, the rate of interest does not act as a price that rations the available supply of credit. Credit rationing is resorted to in such circumstances. Secondly, although the rate of interest may influence household decisions relating to consumption and saving, the rate of interest is not determined in the money market which is highly fragmented, but is policy-determined. Thus the link between the real and monetary sectors through the rate of interest as envisaged by Wicksell-Keynes-Patinkin type models breaks down in a developing economy such as Bangladesh characterized by a rudimentary financial market.

We hypothesize that the mechanism of interaction between the monetary and real sector is as follows :

(1) The business private sector's best alternative to cash balances—in a framework in which there is no well developed market for financial assets and in which there are ceilings on nominal rate of interest—is commodities, mainly durables. Hence, if the public end up with more money than they want to hold, they will spend part of the difference to purchase consumption goods. In other words, the disequilibrium in the money market spills over to the commodity market. This is captured by including supply of money in the household consumption function.

(2) A credit rationing mechanism rather than the interest rate, determines the amount of credit from the monetary system to the private sector. The credit rationing effect is captured by including monetary sector credit in the demand for investment goods.

It is hypothesized that while output may be primarily constrained on the supply side by a shortage of capital goods, there may nonetheless exit some unutilized capacity. In contrast to an industrialized economy where underutilization of capacity can be attributed to a lack of effective demand, it is presumed that in a developing economy characterized by a shortage of foreign exchange, utilization of existing capacity is crucially dependent on the availability of imported inputs.

Real personal consumption and real domestic fixed investment are determined in Block I. In Block II, potential and actual output in real terms are determined. Potential output and the degree of capacity utilization are determined separately; once this is done, actual output is obtained from the equation for capacity utilization.

Block III represents the monetary sector wherein the general price level and the opportunity cost of holding money is determined. In an economy with a developed financial sector, activities in this sector determine the rate of interest which is the opportunity cost of holding money. In a developing economy with fragmented and underdeveloped money and capital markets, the rate of interest does not represent the opportunity cost of holding money. Instead of financial assets being a substitute for money, the alternative to holding money is to hold real physical assets. In this setting it is the nominal rate of return on physical assets which constitutes the opportunity cost of holding money.

Thus, starting from a position of monetary equilibrium, an increase in the supply of money will mean an excess supply of money balances in the hands of the public and this is likely to lead to an increase in expenditures on real assets. This, in turn, is likely to lead to inflationary pressures, depending on the excess capacity that can be utilized. An increase in inflationary expectations will constitute a rise in the opportunity cost of holding money, and this will reduce the demand for money. On the other hand, if the increase in expenditures caused by the increase in money supply leads to an increase in output there will be an increase in the transactions demand for money, and the money market will tend towards equilibrium.

Total nominal tax revenue is determined in Block IV by nominal aggregate output. Government expenditures are determined exogenously by political and economic objectives of government. Government deficit is endogenously determined. It may be noted that taxes feed back into the consumption function by affecting disposable income while the government deficit exerts influence on the change in money supply.

Imports are determined in Block V. It is assumed that exports are exogenously determined. This assumption appears justified in view of the fact that in Bangladesh primary exports constitute an overwhelming share of total exports, and the demand for its exports is determined by the rate of growth of output in the importing countries. In view of this, exports are considered to be exogenously determined.

Three crucial links between the foreign sector and other sectors should be noted. First, investment may be constrained by a shortage of imported capital goods. Bangladesh has to rely heavily on imported capital goods because of the small size and underdeveloped nature of its domestic capital goods sector. Second, due to sluggish growth of exports relative to import demand, it has to rely on foreign capital to finance the major portion of its imports. Third, exports and imports are important to the government exchequer because a large proportion of indirect tax revenue is derived from taxes on the tradables.

Exports, imports, and foreign capital inflow together determine the change in foreign exchange holding of the banking system. The latter together with the government deficit and change in bank credit determine the change in money supply. Money supply is thus endogenously determined.

Statement of the Model

The model consists of eight behavioural equations and nine definitions and identities. There are seventeen endogenous variables and nineteen predetermined variables of which eight are lagged endogenous variables. A variable with an asterisk is a pre-determined variable while a variable without an asterisk is an endogenous variable. All variables are measured annually and refer to the current time period unless otherwise indicated by subscripts. All price variables are in index form.

The variables are :

CNI = Cumulative net fixed investment at constant prices
CP = Personal consumption expenditure at constant prices
$\triangle$CR* = Change in bank credit to the private sector, i.e., $CR - CR_{-1}$

DFI	=	Net domestic fixed investment at constant prices
EXR*	=	Exchange rate, i.e., units of domestic currency per unit of foreign currency
FC*	=	Net foreign capital inflow
FER	=	Foreign exchange reserves
ΔFER	=	Change in foreign exchange reserves
G*	=	Government expenditure at current prices
GDEF	=	Government deficit at current prices
INF	=	Percentage rate of inflation
INT*	=	Nominal market rate of interest
L	=	Money supply defined as currency in circulation plus demand deposits
ΔL	=	Change in money supply
MC	=	Imports of consumer goods at constant prices
MRIK	=	Imports of raw materials, intermediate goods, and capital goods, at constant prices
M	=	Total imports at constant prices
N^{s*}	=	Total labour supply
P	=	General price level
PM*	=	Price of total imports in domestic currency
PMC*	=	Price of imported consumer goods in foreign currency
PMRIK	=	Price of imported raw materials, intermediate goods, and capital goods in foreign currency
RE*	=	Retained earnings plus depreciation allowance of the corporate sector
T	=	Total tax revenue at current prices
X*	=	Total exports at current prices
Y^{po}	=	Potential output at constant prices
Y	=	Gross domestic product at constant prices
YD	=	Personal disposable income at constant prices

The lagged endogenous variables are :

CP^*_{-1}, CNI^*_{-1}, FER^*_{-1}, MC^*_{-1}, $MRIK^*_{-1}$, P^*_{-1}, L^*_{-1}, and Y^*_{-1}.

U_i = Error term

A. Behavioural Equations

I. Expenditures

1. $CP=\phi_1\ (YD, INT^*, L, CP^*_{-1})+u_1$
2. $DFI=\phi_2\ (Y.P, INT^*, CR^*, RE^*, MRIK, G^*, CNI^*_{-1})+u_2$

II. Production

3. $Y^{po}=\phi_3(N^{s*}, CNI)+u_3$
4. $Y/Y^{po}=\phi_4(CNI, MRIK, Y)+u_4$

III. Monetary Sector

5. $L/P=\phi_5(INF, Y)+u_5$

IV. Government Sector

6. $T=\phi_6(Y.P)+u_6$

V. Foreign Trade Sector

7. $MC=\phi_7(X^*_{-1}, CP, G^*, PMC^*, P, EXR^*, MC^*_{-1})+u_7$
8. $MRIK=\phi_8(X^*_{-1}, DFI, PMRIK^*, EXR^*, MRIK^*_{-1})+u_8$

B. Definitions and Identities

9. $YD=Y-T/P$
10. $CNI=CNI^*_{-1}+DFI$
11. $INF=100\ (P-P^*_{-1})/P^*_{-1}$
12. $M=MC+MRIK$
13. $GDEF=G^*-T$
14. $\triangle FER=X^*-M.PM^*+FC^*$
15. $FER=FER^*_{-1}+\triangle FER$
16. $\triangle L=\triangle FER+GDEF+\triangle CR^*$
17. $L=L^*_{-1}+\triangle L$

Description of the Model

Consumption

The inclusion of current disposable income and lagged consumption as explanatory variables reflects that consumption is viewed as a distributed lag function of income.[4] Insertion of liquid assets (as captured by the money supply) into the consumption function may be justified on two grounds—liquid assets may either be regarded as a proxy measure for wealthy or as providing a direct incentive to the consumer to spend.[5] Another financial determinant of consump-

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[4]A Koyck lag structure is assumed.

[5]See [45].

tion, the interest rate, has also been included. Although the dependency ratio is theoretically important, it was not included because it has hardly changed in the time period under consideration (which is between 1960 and 1979).

Investment

Net fixed domestic investment is the sum of net fixed private investment and net fixed government investment. In considering net fixed private investment it is proposed that in each time period there is some desired level of capital stock, and actual capital stock adjusts towards the desired stock in a Cagan-Nerlove geometric process.[6] Following the neoclassical theory of investment behaviour, the desired level of capital stock is determined from conditions of profit maximization subject to a production function. Thus nominal output and the interest rate enter the investment function.[7]

A shortage of funds may prevent the desired level of capital stock from being achieved. The possible sources of funds for firm are : (a) depreciation allowances, (b) net profits, (c) fixed interest borrowing, (d) preference shares, and (e) equity issues. In the context of a developing country with an undeveloped financial sector (a), (b) and (c) may be considered as the primary sources of finance, although dependence on external finance is likely to be greater than other sources.[8]

Furthermore, since the country has a limited ability to produce capital goods, the adjustment of the actual capital stock toward the desired level may be constrained by the availability of imported capital goods.

In view of the above, the speed of adjustment of the actual capital stock to desired level is postulated to be dependent on retained earnings, credit, and imports of investment goods. Hence these three variables are also included in the investment function.

It is assumed that government investment expenditures are positively related to total government expenditures. Finally, since data on the capital stock is not available, cumulative net investment is used as a proxy for it.

Production

The formulation of the potential output function explicitly recognizes a

[6]See [10; 31].

[7]Although neoclassical theory would dictate the inclusion of the price of investment goods, this could not be done due to lack of data.

[8]See [16].

positive elasticity of substitution between labour and capital. In the absence of data on the capital stock, the latter is proxied by cumulative net investment.

The Parish-Godley-Shepherd approach and the Wharton method have most commonly been used to estimate potential or capacity output.[9] However Hilton and Dolphin [15] evaluate these measures and conclude,"..we favour, as a capacity measure, a Wharton type index on the grounds that it is not very far from a theoretical concept of capacity utilization,.." [p. 199]. In view of this, the Wharton method has been used here to estimate full-capacity GDP.

In a developing economy, underutilization of capacity can be primarily attributed to a relative shortage of imported inputs.[10] Inadequate demand may also constrain fuller utilization of capacity. Imports of raw materials, intermediate and capital goods and the level of demand (proxied by total expenditure) are therefore used to explain capacity utilization. The justification for including a proxy for the capital stock as an argument is that, given the relative shortage of foreign exchange to import intermediate goods and raw materials to existing capacity, it is likely that the larger the stock of capital the lower will be the rate of capacity utilization.

Monetary Sector

Both the Neo-Fisherian and Keynesian hypotheses relating to the demand for money assume that there is a desired level of the demand for money which is a function of the level of economic activity and the opportunity cost of holding it (OCHM). In the context of a developed economy, the rate of interest represents the OCHM.

Many scholars have questioned the applicability of Keynesian monetary theory to developing countries.[11] Critics stress the under-developed nature of the financial sector of developing countries, particularly the primitive state of money and capital markets and the paucity of financial assets. In these conditions, it is argued, the desired holding of money are likely to be insensitive to the interest rate on financial assets and will be predominantly transactions balances.

It is not disputed that money and capital markets are under-developed and that financial assets are scarce in developing countries. The crucial question is whether this financial under-development negates the dependency of

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[9]See [13; 18; 27].

[10]See [32].

[11]See for example; [1 26; 39].

the demand for real cash balances on the OCHM. Following Park [38] and Lioi [28] it can be argued that it does not.

The fundamental flaw in the argument of the critics is the assumption that only financial assets, not the real assets, are an important substitute for money—which seems to be an incorrect interpretation of the Keynesian theory of the demand for money. Keynesian theory does not consider real assets as a poor substitute for money; on the contrary, it simply follows the classical theory of portfolio selection in perfectly competitive markets, that is, real and financial assets are perfect substitutes for each other in wealth portfolios.[12] Recent developments in the portfolio approach to the demand for money also suggest that real assets are a good substitute for money and should be introduced explicitly along with financial assets in monetary analysis.

In the absence of a variety of financial assets, the asset choice of the owners of wealth in developing countries will be restricted to holding either money or real assets. Hence, the OCHM is normally measured by the expected rate of inflation.[13] Here it is assumed that the expected rate of inflation is equal to the current rate of inflation. The current rate of inflation, along with income, are therefore included as arguments in the demand for money function.

Government Sector

Direct tax revenue is expected to be positively related to nominal income in the economy. A large proportion of indirect taxes in Bangladesh originates in the foreign trade sector and takes the form of export and import duties. Sales taxes form another major source of total indirect tax revenue. It is realistic to assume that normally exports and imports will be positively related to output and income. Sales taxes are also expected to be positively related to output.

In view of this, total nominal tax revenue is hypothesized to be positively related to nominal output.

Foreign Trade

Total imports are divided into two categories : (i) imports of consumer goods including food, and (ii) imports of raw materials, intermediate goods and capital goods. For both categories of imports it is assumed that there is a desired

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[12]See [42].

[13]In this approach, given the level of output from the effective demand side, the only role that the money market process plays is to determine the rate of inflaton. See Johnson [22].

level of imports and an actual level of imports, which adjusts towards desired imports in a Nerlove-Cagan process. It is also assumed that the speed of adjustment coefficient itself is a variable.

Let us first consider imports of consumer goods. It is reasonable to expect a portion of an increase in consumption expenditures in the economy to be channelled to imports. An increase in the price of imports is likely to cause a fall in desired imports because consumers will tend to substitute domestic goods for imports. Again, the theory of demand dictates that a rise in the price of import-competing goods will lead to an increase in the demand for imports. Since a separate price series for import-competing goods is not available, the general price level is used as a proxy. Finally an increase in the price of foreign exhange in terms of domestic currency will cause an increase in the price of imports and hence a fall in demand, and vice versa. The desired level of imports of consumer goods is therefore hypothesized to be functionally related to the volume of consumption expenditure (private and public), the prices of imports and import-competing goods, and the exchange rate.

In a developing economy such as Bangladesh which is characterized by a relative shortage of foreign exchange, restrictions are usually placed on imports in an effort to avoid balance of payments problems. It is, therefore, likely that the speed with which actual imports adjust towards desired imports will vary with changes in import restrictions. Thus, an increase in import restrictions will slow down adjustment while a relaxation of restrictions will speed up adjustment.

It is reasonable to expect restrctions to vary with the foreign exchange position of the country; an improvement in the foreign exchange position is likely to lead (with a lag) to a relaxation of import controls while a deterioration is likely to cause a tightening of controls. In view of this import control policies may be proxied by exports of the previous period; an increase (decrease) in exports of the previous period is expected to lead to a liberalization (tightening) of import controls.

In the specification of the import demand function for investment goods, the desired level of imports is hypothesized to be functionally related to total investment expenditures in the economy and prices. In general, a portion of an increase in investment expenditure is likely to spill over into imports in an economy. This will be particularly true for Bangladesh since it is characterized by a rudimentary capital goods sector, necessitating a large proportion of the demand for capital goods to be met from overseas. Therefore, an increase in investment demand is likely to lead to an increase in imports of investment goods.

The justification for the inclusion of the price of imports and the exchange rate as explanatory variables in an import-demand function has already been spelt out above. Since few capital goods are produced domestically, and moreover since most imported investment goods are non-competing with domestic investment goods, the price of domestic investment goods is not introduced as an argument in the import-demand function. For reasons noted earlier, the speed of adjustment coefficient is hypothesized to be functionally related to exports of the previous period.

The model was estimated using data for Bangladesh between the period 1960-79. The year 1971 was excluded because this was the year in which the liberation war was fought resulting in widespread dislocation of the economy. Since the time period considered includes both pre-Liberation and post-Liberation years, data have been taken from various published sources of Pakistan and Bangladesh [2; 3; 4; 5; 6; 15; 33; 34; 35; 36; 41]. A detailed discussion of the data used can be found in [40]. Nevertheless some general comments are in order. As is well-known, data is not completely reliable and this is reflected in the fact that estimates of different published sources are often at variance with each other. Care has been taken to ensure, as far as possible, that data for a particular variable is taken from one source. However, the large number of variables in the model compelled the use of different sources of data for different variables, and to this extent there remains an element of inconsistency in the data used.

III. ESTIMATION OF THE MODEL

The model is first estimated and then simulated, the purpose of simulation being model testing and evaluation. Two estimation methods have been used here: ordinary least squares (OLS) and two-stage least squares (TSLS).[14] An arithmetic linear functional form has been used for each behavioural equation.

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[14]A variety of estimation methods are available and, in principle, more sophisticated estimation techniques may result in better simulation performance. However, Fair [17] has compared ten alternative estimation methods and found that the use of more sophisticated estimation methods resulted in only a small reduction in simulation error. The main problem in using the full information methods is that for this method to be used the total number of variables—jointly determined, lagged endogenous, and exogenous—must be less than the number of observations. Furthermore, the complete model must be linear. Neither of these conditions is satisfied in the case of our model.

Let us first consider estimation using OLS. The correlation matrices for some of the regression equations indicated the presence of the problem of multicollinearity. As is well-known, highly correlated regressors result in large variances for the estimators of the coefficients and as a consequence the t-ratios tend to be low. This may have been the case with some of the estimated coefficients which were not significant at the conventional .05 level although on *a priori* grounds one would expect statistically significant coefficients. Although the problem of multicollinearity could not be removed, it is comforting to note that even if some of the regressors are correleated, the estimated equation may be satisfactory for purposes of histroical simulation and forecasting.

It is also possible that statistical insignificance of some of the parameter estimators at the .05 level is due to the inclusion of one or more "unimportant" regressors in the equation. This is because the variance of the parameter estimators, given the sample size, increases in general with the number of regressors. One approach frequently used to improve statistical significance of parameter estimates is to"try" a variable that is thought to be important and then drop it from the equation should it turn out not to be significantly different from zero. In view of this, we experimented by dropping independent variables from a regression when they were statistically insignificant. This led to statistical significance at the conventional level of the independent variables that were retained. However, in principle, these "improved" results were unacceptable to us and hence are not reported.[15] Statistical insignificance of some of the parameter estimates may also be partly attributed to limited sample size.

In equations containing lagged dependent variables as regressors, the Durbin [13] test for autocorrelation has been applied since the Durbin-Watson [14] test is invalid in this case. In other equations the Durbin-Watson test has been used. The Cochrane-Orcutt [12] procedure has been applied to correct for autocorrelation.

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[15]There are two reasons for rejecting these results. First, while the widely employed technique of eliminating variables of no apparent importance has a certain pragmatic value, one should be aware that the way in which it is normally used is not quite legitimate. In particular, after the researcher has dropped a particular regressor from an equation, he should use a new set of data to re-estimate the equation. If the original set of data is reused, an element of circularity is introduced and the resulting estimators can be shown to be biased. Since we did not have a whole new set of data available, and because we were not prepared to ignore the problem of circularity, we did not drop a variable from an equation even if it was not significantly different from zero at the conventional level. Second, most of the variables which were statistically insignificant at the .05 level were significant at the .10 level. The consequence of dropping these variables would be getting biased and inconsistent parameter estimators.

In estimating the model using TSLS, the necessary condition for identification is satisfied for each equation. However, a problem of a different nature, and one which is quite frequently met in the estimation of relatively large macroeconomic models, is faced. In order to use any simultaneous equation method of estimation without further modification, the number of observations must be greater than the total number of variables in the model. Since this condition could not be satisfied, estimation of the model using TSLS appeared impossible.

Various methods have fortunately been devised to circumvent this problem. One method, known as the block-recursive system is to divide the model into blocks and then assume that all variables in a given block depend only on other variables in that block and in blocks for which the solution has already been completed. However, a serious defect with the block-recursive system is that it negates one of the most important facets of econometric models—the interaction among the component parts. Hence this method was not used.

As an alternative, the technique of principal components has been used here.[16] While this method is perhaps the least offensive of the choices available, it should be noted that it is still deficient in the sense that we are no longer specifying the particular exogenous variables which enter the complete system. This increases the probability of mis-specification and hence of biased parameter estimates from that source.

The problem of autocorrelation was faced in estimating some of the equations. To overcome this problem, we use the technique due to Kelejian and Oates [23].

Estimation results using OLS and TSLS are reported in Tables I and II respectively, In general, the estimates obtained by using TSLS were not very different from those obtained by OLS. The signs of the estimated coefficients generally remained unchanged although the magnitude of some of the estimates changed somewhat. Moreoever, estimates which were statistically significant when OLS was used were also significant when TSLS was used, with few exceptions. Results were generally in line with *a priori* expectations.

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[16]This method was first proposed by Kloeck and Mennes [25]. The BMDP 4R computer programme (University of California) was utilized for this purpose. The principal components are computed from the original variables using the correlation matrix of independent variables. The regression analysis is performed in a stepwise manner and the resulting coefficients are reported in terms of both the principal components and the original variables. Principal components are entered in order of magnitude of correlations between the components and the dependent variable.

TABLE I

ESTIMATION OF THE MODEL USING OLS

1. CP =	1930.45	+ 1.005 YD*	−617.396 INT*	0.619 L*	+ 0.200 CP_{-1*}				
	(1119.05)	(0.049)	(107.299)	(0.236)	(0.059)				
R^{-2} =	0.94		S.E.E.=127.156		D.W. = 1.21	h=1.76			
2. DFI =	165.832	0.013 (Y.P.)*	−208.480 INT	+0.365 CR*	+0.429 RE	+0.736 MRIK*	+0.009 G	−0.088 CNI_{-1*}	
	(729.903)	(0.005)	(338.378)	(0.205)	(0.602)	(0.258)	(0.417)	(0.033)	
R^{-2} =	0.91		S.E.E.=78.231		D.W.=2.34				
3. Y^{po} =	17839*	+ 0.016 N*	+0.023 CNI*						
	(5574.64)	(0.359)	(0.004)						
R^{-2} =	0.92		S.E.E=253.128		D.W.=2.17				
4. Y/Y^{po} =	0.699*	− 0.0005 CNI*	+0.012 MRIK*	+ 0.00007 Y					
	(0.197)	(0.00005)	(0.0008)	(0.0001)					
R^{-2} =	0.90		S.E.E=0.015		D.W.=2.37				
5. L/P =	1157.86*	− 0.941 INF	+0.184 Y*						
	(321.517)	(6.581)	(0.017)						
R^{-2} =	0.90		S.E.E=9.348		D.W.=1.61				
6. T =	178.624	+ 0.06 (Y.P.)*							
	(283.72)	(0.008)							
R^{-2} =	0.85		S.E.E.=174.80		D.W.=1.49				
7. MC =	−430.597	+ 1.088 X_{-1}*	+0.159 CP*	+ 0.341 G	−1076.633 PMC	+812.469 P*	−34.841 EXR	+0.016 MC_{-1}	
	(1994.989)	(0.569)	(0.078)	(0.854)	(1065.294)	(385.598)	(246.693)	(0.193)	
R^{-2} =	0.87		S.E.E=189.421		D.W.=2.08	h=−0.27			
8. MRIK =	355.576	+ 0.692 X_{-1}*	+0.551 DFI*	−442.804 PMRIK*	−73.166 EXR*	+ 0.300 $MRIK_{-1}$			
	(303.189)	(0.280)	(0.176)	(174.944)	(37.261)	(0.201)			
R^{-2} =	0.84		S.E.E.= 258.435		D.W.=1.86	h=0.58			

Note : An asterisk denotes that the variable is significant at the .05 level. Figures in parenthesis indicate standard errors.

TABLE II

ESTIMATION OF THE MODEL USING TSLS

1. CP =	4234.62	+0.762 YD*	−891.899 INT + 0.621 L* +	0.631 CP_{-1}*		
	(4333.63)	(0.185)	(983.721) (0.163)	(0.200)		
R^{-2} =	0.93	S.E.E=142.104			D.W.=1.56	h=1.76
2. DFI =	262.860	+0.005 (Y.P)*	−23.463 INT + 0.662 CR*	1.036 RE	+0.443 MRIK	+0.035 G − 0.220 CNI_{-1}
	(698.575)	(0.002)	(280.319) (0.226) +	(0.638)	(0.280)	(0.476) (0.198)
R^{-2} =	0.91	S.E.E=115.012			D.W.=2.33	
3. Y^{po} =	17287*	+0.020 N*	+0.027 CNI*			
	(5275.41)	(0.351)	(0.010)			
R^{-2} =	0.90	S.E.E=143.229			D.W.=2.20	
4. Y/Y^{po} =	0.596*	−0.0002	CNI* + 0.0006 MR1K + 0.00001 Y			
	(0.238)	(0.0001)	(0.0004) (0.00001)			
R^{-2} =	0.87	S.E.E.=0.028			D.W.=2.33	
5. L/P =	276.01	−0.765	INF* + 0.171Y*			
	(571.781)	(0.395)	(0.023)			
R^{-2} =	0.87	S.E.E.=127.866			D.W.=1.99	
6. T =	731.633	+0.034 (Y.P.)*				
	(575.741)	(0.002)				
R^{-2} =	0.92	S.E,E.=101.24			D.W.=1.58	
7. MC =	697.808*	+0.747X_{-1}	+0.058CP* + 1.078G − 2529.357 PMC*	+ 1443.038 P	−135.766 EXR	+0.101 MC_{-1}
	(316.507)	(0.464)	(0.027) (0.883) (1834.025)	(918.857)	(294.424)	(0.162)
R^{-2} =	0.83	S.EE.=210.014			D.W.=2.37	h.=−1.17
8. MRIK =	245.53	+0.452 X_{-1}*	+0.252 DFI* − 329.366 PMRIK	−130.911 EXR*	+0.723 $MRIK_{-1}$*	
	(412.753)	(0.217)	(0.026) (222.337)	(72.241)	(0.293)	
R^{-2} =	0.87	S.E.E.=230.033			D.W. =1.68	h. =0.93

Note : An asterisk denotes that the variable is significant at the .05 level. Figure in parenthesis indicate standard errors.

Our results indicate that not only current income but also past incomes are important in explaining consumption. However, the long-run marginal propensiy to consume is found to be implausibly high.[17] It is likely that the implausible value of the long-run marginal propensity to consume is the result of the "distributed lag bias.[18] Evidence regarding the importance of the interest rate is somewhat ambiguous, the variable being significant when OLS is used and insignificant when TSLS is used. The result sounds a note of caution to those who believe that savings in developing countries cannot be increased through appropriate interest rate policy. Finally, the impact on consumption of change in liquidity is seen to be unquestionable, lending support to the monetarist claim that consumption can be controlled through responsible monetary policy.

Changes in output are seen to be important in explaining fixed investment. Our results are also consistent with the hypothesis that availability of finance is an important factor in explaining investment. Retained earnings of business also appear to have had some influence on investment expenditure. Adequate supply of imported capital goods is also found to be an important determinant of investment.

The importance of the capital stock in explaining increases in potential output is brought out clearly. Increases in the labour force have had no impact on potential output. Bangladesh has a relative abundance of labour and a relative scarcity of capital, and it is the shortage of the relatively scarce factor which appears to have constrained output.

It has been argued earlier that one of the major factors which determines capacity utilization in developing countries is the availability of imported raw materials and intermediate goods. Our results are consistent with this hypothesis. Since capacity utilization is constrained by a shortage of imported investment goods, one would expact that in a country characterized by a relative shortage of foreign exchange, the larger the stock of capital the lower will be the rate of capacity utilization. This is indeed found to be the case. The level of aggregate demand appears to have been unimportant in determining capacity utilization.

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[17]1.25 using OLS and 2.06 using TSLS.

[18]It may be recalled that the consumption function was transformed from an equation in which consumption depended on an infinite distributed lag of income and the Koyck transformation was performed. The use of this procedure results in an upward bias being imported to the parameter estimates.

The transactions demand for money is expected to be particularly important in a developing economy characterized by a small and fragmented financial sector. This is found to be true for Bangladesh. The opportunity cost of holding cash balances, as captured by the rate of inflation, is also seen to exert an important influence on the demand for money.

Import restrictions, as proxied by exports in the previous year, appear to have systematically influenced imports of consumer goods. The level of consumption is another factor which emerges as an important determinant of imports. Other variables which are significant are the price of imports and the domestic price level. Government expenditure is not significant.

Turning to imports of investment goods, it is seen that exports of the previous year is significant, reflecting the practice of import controls. Investment expenditure in the economy is also significant; this shows the import-dependence of investment. Price of imports and the exchange rate are also significant.

Historical Simulation

The model was simulate for the period 1960-1979 (excluding 1971) using parameter estimates obtained by OLS and TSLS. The simulation performed was *ex post* or historical. It was also dynamic, that is, all endogenous veriables appearing as independent variables together with lagged dependent variables assume their solution values. For the initial year however, the values of the lagged endogenous variables are given from outside the system.

The criterion used to evaluate simulation performance of the model is the "fit" of the individual variables in a simulation context; that is, is examined how closely each endogenous variable tracks its corresponding historical data series. Two measures which kave been used for this purpose are: the Root-Mean Square (RMS) simulation error and the RMS per cent error. Results are reported in Table III.

Low RMS simulation errors are only one desirable measure of simulation fit. Another important criterion is how well the model simulates turning points in the historical data. To examine how the turning points have been simulated, the actual and simulated values of the variables were plotted on graph paper. The simulated values used in the graphs were generated by simulations performed with TSLS estimates.

TABLE III

HISTORICAL SIMULATION

Variable	Simulation Using Parameter Estimates Obtained by OLS RMS Error	RMS Per Cent Error	Simulation Using Parameter Estimates Obtained by TSLS RMS Error	RMS Per Cent Error
Personal consumption (CP)	6206	38.48	4776	32.41
Fixed investment expenditures (DFI)	249	15.32	408	26.67
Potential output (Y^{po})	732	3.43	1320	5.45
Gross domestic product (Y)	5899	32.35	4907	29.57
General price level (P)	0.32	39.00	0.55	21.37
Imports of consumer goods (MC)	478	40.25	751	43.14
Imports of investment goods MRIK)	357	28.93	247	19.78
Tax revenue (T)	976	70.31	744	48.92

In general, the simulation performance of the model has been resonably satisfactory given the small size of the model. However, for the period immediately after liberation it has not been as good as for the period prior to the independence of Bangladesh. This is understandable in view of the fact that the economy had to bear the impact of a war and also experienced catastrophic floods immediately afterwards. Finally, as expected, simulation performance improved with the use of TSLS estimates compared to OLS estimates.

Simulation of the general price level has not been very satisfactory. The hypothesis about price determination put forward in the model is that only monetary forces determine prices. One reason for unsatisfactory simulation of the price level could be that structural and institutional factors have also influenced prices. Since taxes are related to nominal GDP, unsatisfactory simulation of the price level has also affected the simulation of tax revenue. Given the small size of the model, simulation of the other variables may be considered to have been satisfactory.

Normally, for a linear model, its characteristic roots can be utilized to determine whether the model is stable or not. If, however, the model is nonlinear, as is the case with our model, the characteristic roots cannot be used to determine stability of the model solution. In this situation, if the time-paths of the variables predicted by the model bear a reasonable resemblance to the actual behaviour of the economy, this may be taken as an indication that the dynamic structure of the model is representative of that of the actual economy. In terms of this "rule of thumb" approach, it appears that our model is dynamically stable; graphs of the actual and simulated values of the variables show that the turning-points have been fairly accurately simulated.[19]

IV. CONCLUDING REMARKS

The primary objective of constructing a macro-economic model of Bangladesh is to help our understanding of the workings of the economy. Needless to say, the operation of the modern-day economy is very complicated and as in the case of all economy wide models, and more so because of the relatively small size of our model, we can hardly claim that our model gives a detailed picture of the Bangladesh economy. Nevertheless, the model does focus attention on some key macro-economic variables, and this is no less useful.

Policy simulations could have been performed with this model and this would have thrown light on the impact of proposed policy changes on variables of interest. Policy simulations were not however attempted since this was considered to be outside the scope of this paper. Nonetheless the knowledge gained by an examination of the signs and magnitudes of the parameter estimates of the model together with the insight obtained from historical model simulation enable us to make some comments on policy issues in Bangladesh. The comments which follow should however be treated as tentative.

a) The strong influence of liquidity on comsumption expenditures indicates that monetary excesses can be held at least partly responsible for inflation in Bangladesh. Inflationary expectations may also have added fuel to the inflationary pressure by causing dishoarding idle balances. The major source of the increase in money supply have been credit creation, deficit financing by the government, and foreign capital inflow (mainly foreign aid). The policy

[19]See [40] for those graphs.

implication is that if inflation is to be controlled then the government must desist from deficit financing and a brake should be put on credit creation. Whether this would be a feasible policy alternative is a difficult question to answer in view of the fact that investment is crucially dependent on the availability of credit and the government has to shoulder a major part of the burden of development. We do not wish to pursue this matter any further and only note that the policy-maker in Bangladesh is faced with some very difficult choices.

b) Interest rate policy may be used to mobilize savings in Bangladesh. This policy becomes all the more attractive in view of the fact that a higher interest rate is unlikely to deter investment.

c) Policy makers should take note of the fact that production in Bangladesh is crucially dependent on the availability of imported capital goods, raw materials and intermediate goods. Any attempt to reduce imports of these items, *ceteris paribus*, will lead to lower output due to (i) reduced investment and (ii) lower level of capacity utilization. Adequate imports of investment goods must therefore be ensured if the economy is to grow smoothly. In other words, foreign aid inflow and/or export earnings must increase if some satisfactory growth rate is to be achieved and sustained.

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Relative Efficiency of Alternative Techniques in the Cotton Weaving Industry of Bangladesh : A Case Study

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This paper has, as its opening premise, the proposition that any efficiency—comparative exercise relating to techniques coexisting in Bangladesh with varying mechanisation must explicitly seek to isolate technical efficiency from the price and allocation effects of social discrimination that handicap the cottage and small-scale producers. It then closely examines the nature of entrepreneurial acquisition of scarce resources so as to have a basis for isolating the market-structural versus the technical influences on observed relative efficiency. The study finds that the sample mills, who only have a modest edge over the smaller enterprises in cloth-output per loom in operation, have, due to their elaborate fixed assets, much higher comparative capital—net output ratio. The handloom units outclass the mills in the productivity of recurrent imported input, as also record much higher rates of surplus on the capital employed. The handloom method was found to remain markedly superior to the mill-method even after the effects of important imperfections of factor and product markets were accounted for.

I. INTRODUCTION

A good deal has been written in the last thirty years about the relative efficiency of traditional, less mechanised techniques on the one hand, and modern, power-using ones on the other.[1] This strand of works can be classed as of the

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*The author is a Research Economist of BIDS. This paper is adapted from Ch. 6 of his Ph.D thesis submitted to the Cambridge University. He is grateful to his Cambridge supervisor, Prof. W.B. Reddaway for meticulously overseeing the development of the thesis. He is thankful to the participants of a BIDS Seminar in which an earlier version of this paper was presented. In particular, Prof. R. Sobhan's observations have led to marked improvement in the completeness of the paper. All remaining shortcomings are due to the author alone.

[1]See, for example, [1; 2; 6; 11; 12; 14; 16].

choice-of-technique genus, and, in connection with its deficiency noted below, has to be distinguished from social cost-benefit type of works.[2] Simply put, the flaw is that factor costs are evaluated at prevailing market prices, and this may distort efficiency-ranking on account of the following three considerations. First, price signals obtained from primary factor markets in LDCs are out of line with scarcities. Second, as for secondary inputs, which often account for a much larger proportion of total factor costs, traditional small enterprises may suffer from special handicaps beyond the usual ones associated with economies and diseconomies of scale. For example, initial inequality in wealth and economic power may disequalise access to each market taken by itself. Matters are compounded by the fact that segments of different markets are sometimes systematically interlinked. Finally, decision processes involving pricing and allocation of virtually all scarce production resources are centralised in the institutions of the state. However, as Lipton has put it, "the 'state' is not a faceless body of social optimisers, but the embodiment of powerful interests, especially the interests of the city" [9, p. 268]. Techniques operationally associated with powerful interests can easily out-distance others, but this may be due as much to institutional privilege as to the efficient utilisation of resources. Comparative efficiency of traditional and modern techniques may be systematically biased by such social discrimination.

This paper seeks to rank three techniques for cloth-weaving currently co-existing in Bangladesh, giving due cognizance to the possibilities of distortions mentioned above. Accordingly, the nature of pricing and allocational performance of input markets, especially from the viewpoint of equity among entrepreneurs, is explicitly used as a spring-board for the desired comparison. The paper is structured as follows. In Section II, we closely examine the nature of entrepreneurial acquisition of scarce resources in order to have a basis for isolating the *market-structural* as opposed to poduction-function influences on the observed relative efficiency. Section III presents our findings and conclusions about which technique is socially optimal, the criteria being those of (a) addition to present income, given the capital stock, and (b) the rate of surplus after meeting all charges, given the stock of capital.[3]

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[2]The differentiation is required because while the choice-of-technique type of contributions have often not allowed, empirically, for possible discriminatory price variations across techniques in arriving at final efficiency ranking, the very *raison detre* of social cost-benefit type of analysis lies in the fact that market prices in developing countries typically fail to correspond with social costs. Presently, we refer to relative efficiency in the specific context of the former strand of literature only.

[3]The sources and nature of data underlying this paper can be seen in Ch. 3 of the author's thesis [4].

II. ENTREPRENEURIAL PROVISION AND MARKET STRUCTURE IN COTTON WEAVING INDUSTRY OF BANGLADESH

The Conceptual Basis

A basic premise of this study is that, under the socio-institutional conditions prevailing in Bangladesh, the association between an entrepreneur and his techniqe is more properly seen as following from a social division of labour, not an atomistic, individually determined optimising choice. A related conceptual basis is the distinction between *resource-acquiring* versus *resource-utilising* function of entrepreneurship.[4]

Entrepreneurship, essentially, means (a) 'efficient' acquisition (in the sense of minimising private cost) of real and physical resources; (b) 'efficient' utilisation (in the same sense) of the resources so acquired. All the various entrepreneurial functions, as for instance have been listed by Kilby [8, pp. 27-8], can be dichotomised as above on a reasonably clear-cut basis. However, the performance of the resource using roles of entrepreneurship is warranted only when the resource acquiring roles have been effectively performed. One could thus argue for a pre-eminence of the *resource-acquiring* roles of entrepreneurship relative to the *resource-using* roles in explaining measured relative performance in any given industry. This is because, first, the inequalities, generated over historical time, among market-participants in wealth, information and power make the pricing and allocation of (i.e., the command over real resources), dependent on the prevailing power structure. Second, these historical imperfections are ossified due to the manner in which governments regulate the allocation and pricing of scarce resources in regimes of planning. Since the government holds the key to continued provision of scarce resources on preferred basis, favourable access to its operating arms (i.e., what Kilby grouped under the political administration functions of an entrepreneur) may be regarded as a significant, perhaps the most significant, element of entrepreneurship.[5]

Particularly in LDCs the more important entrepreneurial functions influencing mesured relative efficiency are those of acquiring command ever scarce resources on preferential basis. Of course, the roles of entrepreneurship associated with efficient utilisation of given resources do not thereby become altogether unimportant. But the resource-acquiring roles assume a significance of

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[4]For a more elaborate discussion of these conceptual issues, see [4, pp. 37-41 and pp. 44-8].

[5]Ranis pointed out quite early on, "Further, the quality of the hidden entrepreneurship may differ considerably among firms if it is defined in terms of the ability to sail through red-tape and getting things done, as district from conventional flair for innovations and the like" [13, p. 345].

greater proportion. We shall argue that in this resource-acquiring role, the typical handloom entrepreneur is at a distinct structural disadvantage compared to the large cotton mills. This we shall show by analysing the functioning of three important input markets, namely those of yarn, intermediate imports and bank credit.

Entrepreneurial Differentiation in Input Markets

We begin with the situation in yarn market. Table I presents the evidence on the quantities of yarn "absorbed" by the handloom and mill-weaving sectors, and the proportionate importance of the sources of yarn supply to the handloom industry.

The first point to note is that in all the three quinquennia, the handloom sector has been the predominant client of the spinning segment of the cotton industry. For example, it accounted for 72 to 86 per cent of the output of the spinning industry during 1965/6—1976/7. Under appropriate conditions, the handloom sector could have used its major position as a client as leverage for securing advantages from, or at least precluding disadvantageous action by, its yarn supplier. However, despite its aggregate importance, the handloom industry has had very little countervailing economic power, in that it has either passively welcomed any promotional action by the state in its favour or passively bemoaned its lack of power to hold its own against unfavourable decision that undermined its viability. One such decision was the one by Bangladesh Textile Mills Corporation (BTMC) to re-instate the looms which had been dismantled before 1970 to escape capacity taxation. As Table I shows, this resulted in the BTMC weaving establishments cornering a fractionally larger share of its own yarn output immediately after independence. This coupled with the inability of the handloom industry to muster the degree of financial power necessary to ensure a commensurate level of yarn import, has especially handicapped the handloom producer in securing adequate supply of yarn.[6]

[6]This problem of relative quantity shortage has perhaps been aggravated due to two quality changes, both of which have worsened the competitive strength of the handloom sector. First, the domestic yarn output has persistently shifted in the post-liberation era as compared with 1969/70, towards relatively fine counts at the expense of medium counts. The timing of this change was unfortunate from the standpoint of the handloom industry as a whole, as a result of the lack of corresponding changes in demand and the post-liberation period cessation of financial help from the mills in the distribution of yarn [4, pp. 90-1]. The hand-weavers have also been disadvantaged in that BTMC has followed a policy of raising the share in yarn output of mixed-yarn (a mix between cotton and man-made fibres, e.g., viscose, polynosic, etc.) : from zero per cent in 1969/70 to 30% in 1976/7. Mixed-yarn is an inferior substitute for all-cotton yarn, and the price differential does not quite match the fall in handloom productivity and in cloth quality. However, in its yarn conversion, the BTMC only uses all-cotton yarn. It is common to both these changes that it is the handloom industry, not the large-scale weaving industry, that has been constrained to adjust involuntarily to them.

TABLE I

SELECTED ASPECTS OF SECTORAL DISTRIBUTION OF AVAILABILITY OF YARN, 1960/1, 1976/7

Periods	Total Quanity of Yarn Supposedly Utilised (million lbs.)		Total	% of Own Yarn of the Large Scale Spinning Industry Retained for Weaving incl. Stock Changes	% Distribution of Yarn Supply for Handloom Industry	
	Mills	Handlooms			From Mill Sector.	Net Yarn Imports
1960/1 - 1962/3	10.6	81.2	91.3	20.3	43.5	56.5
1963/4 - 1964/5	9.8	75.0	84.8	15.4	61.3	38.7
1960/1 - 1964/5	10.3	78.7	89.0	18.2	50.1	49.9
1965/6 - 1967/8	14.5	72.9	87.4	19.3	71.9	28.1
1968/9 - 1969/70	17.8	89.8	107.8	17.8	78.6	21.4
1965/6 - 1969/70	15.9	79.6	96.5	18.7	73.8	26.2
1972/3 - 1974/5	23.5	64.9	88.4	26.4	86.0	14.0
1975/6 - 1976/7	8.0	85.2	93.2	9.5	77.3	22.7
1972/3 - 1976/7	17.3	73.0	90.3	19.9	80.9	19.1

Source : [4, Table A2.2].

Further the yarn market has been characterised by a short supply of the yarn counts with a wide demand base, and a systematic governmental integration into institutionalising the yarn distribution. Favourable access to the relevant political and/or administrative arms of the state became, as never before, perhaps the most critical factor behind access in the yarn market. What proportion of one's yarn requirements was accommodated at government-controlled supply outlets is one aspect of the access to the yarn market.

There is evidence to suggest that of the three classes of enterprises, the handlooms have the least favourable performance of exchange functions in the yarn market. First, in both years, the proportion of yarn requirements met from the relatively cheap governmental supply outlets was the lowest for the handloom industry [4, Table 5.11]. This handicap was aggravated in that the typical hand-weaver pays higher distribution margins on his yarn deliveries, no doubt sometimes including scarcity premia accruing to his mercantile "bosses" than was the case with his competitors [4, pp. 230-2]. Since yarn accounts for about three-fifths of the production costs in cotton-weaving, any depression of measured relative efficiency stemming from failures on exchange performance will be decisive.

We next take up the market for credit. In an economy with serious shortage of savings, relative credit availability at affordable rates of interest will be a critical influence on relative measured efficiency of various techniques. For example, one's favourable credit provision permits the reaping of economies of scale in purchase. Besides, credit power is an important aspect of one's balance of economic power, a subtle but still significant influence on the allocational and pricing processes in the input markets. How credit provision varies for the three classes of enterprises on our sample is therefore of interest.

As a measure of the extent of credit accommodation, we have used the information on whether or not a given enterprise in any of the three categories has a bank cash credit limit. The proportion of enterprises with institutional credit accommodation was found to be the lowest among the handloom sub-sector [4, Table 4.13].

Virtually the same picture emerges in the market for imports. An analysis of the relevant figures [4, ch. 5] pointed to a virtually complete exclusion of the handloom sector from the market for imports on preferential terms, while all of the large-scale weaving units on the sample are provided with official import entitlements. This forces upon the handlooms a degree of reliance on the more

expensive commercial sources of imports which can only adversely divert away from the enterprise a part of the potential surplus which might otherwise have existed.

At the same time that we have mentioned the forces which reduce entrepreneurial performance of the handloom sector, it is also necessary to record the forces which reduces similar performance by the mills. First, the wages mills pay seriously overstate the social costs of employing labour. There is a difference of as much as 40% between the wage rates between the handlooms and mills for roughly comparable jobs. Second, the output prices for the mills are controlled, while the small scale units do not have their prices fixed through fiats. These considerations imply that we must give the mills some credit to neutralise the effects of these.

In the light of this discussion, we may now turn to an examination of our findings and conclusions.

III. FINDINGS AND CONCLUSIONS

Before proceeding any further, we must consider the possibility that the levels of physical productivity actually attained by the BTMC weaving establishments during the two years of interest to us did not represent the results of conscious optimising market-oriented behaviour. Instead they were products of policy decisions of a largely political nature. It has been argued for instance that the poor capacity utilisation (which varied between 36% and 41% on three shift definition of full capacity) in the weaving establishments of BTMC mills during 1975/6 and 1977 was due to government orders that yarn be directed to meet the needs of the handloom sector.[7] If true, this qualification would invalidate any relative efficiency ranking in net terms, on the ground that the handlooms and mills were not playing under the same rules.

There are at least three reasons why, at least in these two years, this qualification does not substantively apply. First, it is known that the yarn-distribution, involving both home output and imports, was de-controlled in May 1975 in order to give market forces greater, not less, play, and this situation prevailed intact until March 1977, that is, throughout most of the two years studied. Further, the government policy since 1975 was known to reemphasise the market forces in general, at the expense of industrial management by administrative

[7]This argument was put forward by Prof. Rehman Sobhan in a seminar at BIDS,

fiats. To believe that, while the spinning activities of the BTMC mills would be managed *commercially*, the weaving establishments were put in a straight-jacket by a government that was systematically abjuring the tenets of control and espousing privatisation of trade and commerce would be a little simple-minded. Further, at least in 1975/6, when mills' yarn stocks were still at an uncomfortably high level (of 2.47 months' output), there was scarcely any rationale for starving mill weaving capacity (see [4, Table 2.3] in this connection). Only in 1976/7, with still high levels of mill cloth inventory and an acute shortage of yarn all around, could there have been a deliberate starving of the weaving establishments of yarn. However, it is arguable that, this divertion was due to *market* forces, not administrative decrees. The point is that it was profitable, at the margin, for mills to sell yarn rather than cloth. Indeed, mill-weaving was often loss-making, not least of whose causes had to do with the inability to extract high rates of utilisation and to spread the large overheads more thinly.

Finally, one must also note that the average rate of capacity utilisation achieved by the mills of about 38% for the years 1975/6 and 1976/7 was not all that low by historical standards. In his 1971 work on capital utilisation of West Pakistani industries [17], Winston reports a figure of 69.5% for utilisation in the textiles industry using a 2.5 shifts per-day definition. In all probability this estimate is for cotton spinning only. Had 3 shifts per day underlain the definition of full capacity, then utilisation rate would have been more like 58%. However, weaving utilisation has always been lower than spinning utilisation: this is virtually a technological datum. For example the spinning departments of the sample mills record utilisation of 60% and 68%, respectively, in 1975/6 and 1976/7 [4, Table A 6.7]. It is certainly not beyond the realm of possibility that the utilisation rate of the weaving establishments in West Pakistan in the year of Winston's study may, on 3-shifts definition, have been only fractionally higher than the 38% reported for our mills. Add to this the fact that the West Pakistani entrepreneurs had the power to ensure the import of better equipment for location in the prized West Pakistan market as compared with equipment for location in the then East Pakistan. As such the BTMC mills' poor utilisation rate should not cause one to invoke the red herring of a public-sector unit helplessly being underutilised at the behest of rigid administrative decrees.

With this necessary aside, we may now turn to consider the findings. The evidence on comparative physical productivity is first presented, followed by relative net productivity on the basis of prevailing product and input prices. Finally, certain re-computations involving an assumed price-regime are conducted, and their effect on relative efficiency examined. Certain preliminary

explanations of the untenably low relative efficiency of mill-weaving call an end to the paper.

Relative Physical Productivity

We may now like to examine the relative physical productivity of the equipment of the sample units. Table II presents the necessary details. The following findings emerge from this table. First, the average loom-year output of the mills in the two years is found to be about 5.7 times that of the average handloom units (15442 yds. as against 2696 yds. for the handloom sector as a whole over the same period). On a similar basis, the mills' output per loom-year exceeds that of the powerloom sector by an even more slender multiple of 1.86 (8281 yds. for the two years). Second, all units have suffered a decline in the unit productivity of their equipment in 1976/7 relative to 1975/6. The greatest proportionate decline has been recorded for the handloom units, although we can not but underline the remarkable flexibility with which they seem to have accommodated the quantitative, as opposed to price, aspects of the supply dislocation of 1976/7 (cf. the percentage in rows B(12) and B(13) across columns.)

Mill-weaving in Bangladesh, though it predictably has a clear superiority in output per loom, has however failed to out-strip the handloom units to an extent commensurate with the relative capital-labour retios: while relative (fixed) capital-labour ratio of mills to handlooms for the two years as a whole is an average multiple of more than eleven (Table IV, Panel-B, row 2), the matched relative loom-year output is much lower. The result is an adverse impact on the measured efficiency of the mills. This statement is corroborated in greater detail in the next section.

Inter-technique Efficiency at Prevailing Prices

How does this proportionate physical product superiority compare with the relative unit input of the scarce factors, viz., capital and imports ? But first let us look at the comparative unit cloth prices for the sample units in the two years (Table III).

We find that the handloom and powerloom units have raised average prices in 1976/7 by about 18% while the mills have succeeded in raising theirs by only 8%. The fact is that the pricing of mill cloth is subject to a political decision process. There were no doubt upward pressures on the unit production costs in 1976/7 for units in all sectors. If BTMC were fully autonomous in price fixation, it would have been able to price itself fully out of trouble. This is not mere speculation : during our survey of the yarn-traders in Narayanganj,

TABLE II

LOOM PRODUCTIVITY PER UNIT IN HANDLOOMS AND MILLS, 1975/6, 1976/7

	Handloom Units			Power-loom Units	Mills		
	1-14 Looms	15+ Looms	All Units		Old Mills	New Mills	All Mills
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(A) Year : 1975/6							
1. Yardage (000 yds.)	1282	1104	1260	857	29960	45990	75950
2. Loom-shifts (000s)	124.5	100.6	121.6	59.6	1464	2215	3679
3. Operating looms (Nos.)	465	378	454	101	2185	2662	4847
4. Output/loom/year (yds.)	2757	2921	2777	8485	13712	17276	15669
5. Output/loom/shift (yds.)	10.3	11.0	10.4	14.4	20.5	20.8	20.6
(B) Year : 1976/7							
6. Yardage (000 yds.)	1053	907	1035	735	25140	42710	67850
7. Loom-shifts (000s)	106.4	89.0	104.3	52.9	1310	2082	3392
8. Operating looms (Nos.)	404	338	396	91	1899	2560	4459
9. Output/loom/year (yds.)	2606	2683	2615	8077	13238	16684	15216
10. Output/loom/shift (yds.)	9.9	10.2	9.9	13.9	19.2	20.5	20.0
11. Row 6 as % of row 1	82	82	82	86	84	93	89
12. Row 9 as % of row 4	94	92	94	96	96	96	96
13. Row 10 as % of row 5	94	92	94	96	94	98	97

Notes : (a) For all sample units, yardage measured is in standard unit of cloth.

Source : Data from the sample survey.

TABLE III

COMPARATIVE CLOTH PRICES, AND PRICING FLEXIBILITY OF THE HANDLOOM, POWERLOOM AND MILL UNITS, 1975/6, 1976/7

(All figures are weighted : Tk./yd.)

Year (1)	Handloom Units (2)	Power Looms (3)	Mills (4)
1. 1975/6	6.94	6.02	5.60
2. 1976/7	8.19	7.18	6.02
3. Unit Price in 1976/7 with 1975/6 as 100	118	119	108

Notes : (a) First unit-specific price per yard was estimated using relative yardage of each type cloth made as the weights. Unit-specific averages were further weighted by the relative yardage made by the unit in question in the given year in order to arrive at the average values presented above.

Source: Data from the sample surveys.

the most important textile centre of the country, retailers were found to peg the first quotation for several better-known mill-made lines at between 45% to 50% higher than the respective ex-mill price.

We should therefore note that during 1976/7 cloth prices charged by BTMC lagged behind costs as well as realistic market-clearing prices, which reduced its net income.

Comparative Net Partial Sector Productivity

We may now turn to the details of relative productivity of the sample techniques. The basic tables are presented in the appendix Table A6.4 of [4]. Tabla IV presents the productivity of labour, capital and recurrent imports.

The following main conclusions may be drawn from Table IV. First, mills, net output per man employed in a normal year (such as 1975/6) is higher as compared with the handloom units. The labour productivity of mills was about 81% higher relative to handlooms in 1975/6 (Panel-B; row 6). However, this percentage differential was slightly lower than that achieved by the average powerloom unit.

The handloom units suffered a considerable decline in 1976/7 in their net labour productivity over 1975/6, the figures for the two years being Tk.1650 and Tk. 2030, which imply a decline of 19% or so. Labour productivity of the powerloom units also fell over the same period by 19%. However, output per man of the sample mills is found to have fallen from Tk. 3670 in 1975/6 to Tk. 1758, i.e., by 52% (Panel-A, row 3). (This disproportionate decline is of course largely due to the lack of pricing autonomy of the BTMC). As a result, we have the peculiar situation where mills, with elaborate machinery and management record an average level of labour productivity (Tk. 1758 per man per year) which is much lower than the achievement of an average powerloom unit (Tk. 2993).

It is sometimes suggested that (fixed) capital-output ratio of cottage enterprises in LDCs is usually less than unity. Sen has estimated the unit working capital input for small-scale industries as a whole to be in the range of 0.40—0.60 for India as at the end of the 1950s [15]. Khan estimated (total) capital-output ratios for small-scale and cottage-based industries of Bangladesh (as in the 1960s) to be 0.58 and 0.55, respectively [7, p. 61]. For large-scale industries, he reports a value of 1.73. Hewavitharana has reported (fixed) capital-output ratios of. 0.40, 1.68, and 2.9 for handloom, non-automatic powerloom and automatic powerlooms, respectively, in Sri Lanka using data from an ILO study made in 1962 [6, p. 436]. The matched ratios between working capital and net output were found to be 0.53, 2.81, and 3.3. While our own findings regarding the capital productivity of the handloom and powerloom units are quite sensible, given the above findings, the estimtes for the sample mills are very different from what one would expect under usual circumstances.

The capital-output ratios are found to be 0.92, 3.05 and 16.28 in 1975/6 for the average handloom, powerloom, and mill unit.[8] Even so, we must stress the remarkable economy of working capital input achieved by the handoom units especially (Table IV, row, cols. 2 and 5). The capital-output ratio for the handloom sector as a whole is found to be less than unity in 1975/6. In fact, handloom units seem to surpass even powerloom units quite conspicuously as far as capital-output ratio is concerned (Panel-A, row 6, cols. 2 and 3). This is all the more notable, because the net output per loom year for the handloom units in 1975/6 was less than half that for the powerloom units (Panel-A, row-7, cols. 2 and 3).

[8]It will no doubt be noted that the sharp disproportionality between the fixed capital and working capital of the mills relative to net output in 1975/6 is partly due to the still relatively large volume of output stocks of that year. To the extent that it is proper to ascribe them to an administrative bungle for which BTMC can not alone be held responsible, part of the measured inefficiency (of a multiple of 17.70; see Panel-B, row 9) in the use of capital that we here have ascribed to the *technique* of mill weaving in that year will arguably to unwarranted. However, this is unlikely to change the conclusions materially.

TABLE IV

RELATIVE NET PARTIAL FACTOR PRODUCTIVITIES AMONG VARIOUS TECHNIQUES CURRENTLY AVAILABLE IN BANGLADESH WEAVING INDUSTRY, 1975/6, 1976/77

Particulars	1975/6			1976/7		
	Hand-loom Units	Power-loom Units	Mills	Hand-loom Units	Power-loom Units	Mills
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Panel-A			
1. Net output (Tk. 000s)	2363	1239	48960	1673	907	23130
2. Net output/production worker (Tk.)	2582	4441	4298	2097	3614	2070
3. Net output/person employed (Tk.)	2030	3688	3670	1650	2993	1758
4. Fixed capital/net output (year)	0.63	2.58	4.41	1.04	4.15	11.13
5. Working capital/net output (year)	0.29	0.47	11.87	0.41	0.70	4.40
6. Total capital employed/ net output (year)	0.92	3.05	16.28	1.46	4.85	15.54
7. Net output/loom in operation (Tk.)	5211	12267	10101	4230	9967	5187
			Panel-B			
1. Employment/loom/shift	100	65	45	100	65	44
2. Fixed capital/employment	100	756	1283	100	731	11114
3. Total capital/employment	100	612	3242	100	610	1115
4. Net output/loom	100	235	194	100	236	123
5. Net output/ production worker	100	172	166	100	172	99
6. Net output/man employed	100	282	181	100	181	106
7. Fixed capital/net output	100	400	700	100	399	1070
8. Working capital/net output	100	162	4093	100	171	1073
9. Total capital/net output	100	332	1770	100	332	1064
10. Imports/net output	n.a.	n.a.	n.a.	100	222	182

Notes : (a) Figures in Panel-A are expresssd as indices in Panel-B, with figures for handloom sector as a whole as the basis.

(b) 1976/7 relative (fixed) capital labour ratio for mills is lower than in 1975/6, due to the passage of one year eroding a greater percentage of capital stock value than in the case of handlooms. The age-structure of the mills is responsible for this asymmetry.

Source : Data from the sample surveys.

As for 1976/7, the over-all inter-technique relativity was the same as in 1975/6. The handloom and, to a slightly larger extent, powerloom units experienced a decrease in the productivity of capital in 1976/7 relative to 1975/6. Even so, one can unambiguously regard the handloom production as the most efficient so far as the maximisation of current output, given the capital available for invest ment, is the objective of concern. (We may note that the excess of the average handloom unit in the productivity of capital and recurrent import over both the matched powerloom and mill unit at of 1976/7 was found to be significant at 5% level of significance.) Further, the average handloom is also found to have the highest productivity in intermediate imports. On the prevailing prices, then, the handloom method is in the best economic interest of Bangladesh, so far as the maximisation of the current output is the objective.

However, one must also look at the ratio of the surplus to capital employed before saying anything further. The relevant details are presented in Table below. First of all a brief elucidation of the nature of the table may be helpful. It will be realised that measures of surplus must be net of any payments of wage-equivalents, say, to unpaid family labour, of which there is some incidence among the sample handloom units. We have therefore estimated net surplus (i.e, net value added minus wage/salaries paid in cash, and wage-equivalents) on three alternative bases. One of these assumes that family labour may be costed at zero opportunity cost. The other two assume that family labour is not entirely a free factor but remains in paid casual work (a) for the assumed full-working year of 250 days and (b) for 188 days, the last implying that casual labour remain unemployed for one fourth of the working year.

The following conclusions may be drawn from TableV. First, we note that the sample mills have recorded negative rates of surplus in both the years examined. While the extent of the negative surplus is found to become uncomfortably high in 1976/7, no doubt largely due to the price-control, the fact that the rate of surplus is negative even in 1975/6 (when such political factors can not be invoked) means that there are real factors as well behind the inefficiency of mill-weaving. This point made, we may turn to some comparative observations for the sample techniques. First, if we assume that family labour has no opportuity cost at all, then handlooms appear to have a very significant superiority over the other two alternative techniques (Table V, row A (4), cols. 2-7). On that assumption, in both years, average rate of surplus for the handlooms is found to be about twice that for the powerlooms. The contrast between the handloom units and the sample mills, on that basis, is even more striking.

TABLE V

RATES FOR SURPLUS GENERATED BY THE SAMPLE UNITS, 1975/6, 1976/7

Particulars	1975/6			1976/7		
	Hand-loom Units	Power-loom Units	Mills	Hand-loom Units	Power-loom	Mills
1	2	3	4	5	6	7
(A) Without Imputation on Family Labour :						
1. Net Surplus (Tk. 000s)	683	542	—129900	302	264	—111160
2. Surplus/loom (Tk.)	1533	5362	—26808	763	2907	—24929
3, Capital/loom (Tk,)	4880	37473	164446	5148	48350	80606
4, Rate of Surplus (%)	31.5	14.3	—16.3	—14.8	6.0	—30.9
(B) With Imputation : Assumption 1						
1. Net Surplus (Tk.)	54	519	n.ap.	—327	242	n.ap,
2. Surplus/loom (Tk.)	171	5136	n,ap.	—797	2656	n.ap.
3. Capital/loom (Tk.)	4880	37473	n.ap,	5148	48350	n.ap.
4. Rate of Surplus (%)	2.5	13.7	n.ap.	—15.5	5.5	n.ap.
(C) With Imputation : Assumption 2						
1. Net Surplus (Tk.000s)	211	524	n.ap.	170	247	n.ap.
2. Surplus/loom (Tk.)	512	5192	n.ap.	—407	2718	n.ap,
3. Capital/loom (Tk.)	4880	37473	n.ap.	5148	48350	n.ap.
4. Rate of Surplus %	10.3	13.8	n.ap,	– 8,2	5.6	n.ap.

Notes : The symbol n. ap. means not applicable.

Sources : Data from the sample surveys.

However, imputation for family labour costs is a logical necessity, and, once performed, changes the situation considerably. The handlooms now lose ground to the powerlooms (examine rows B(4) and C(4)). But, even so, the handloom units out-do the sample mills in both 1975/6 and 1976/7 (rows B(4), cols. 2 and 4, cols. 5 and 7). It is the powerloom units who turn out to be the technique with the highest rates of surplus after imputation, in both years. This is especially evident in 1976/7, when the powerloom technique is the only one with positive post-inputation rates of surplus.

Inter-technique Efficiency Assuming More Competitive Prices

It is of course possible that when we allow for market imperfections, some of the above conclusions may have to be qualified. Several adjustments were made to find out if this was really so. For the mills, we recalculated net income and surplus assuming that cloth prices were higher by 20% than it really was. That is to say, *ceteris paribus*, cloth revenue of mills in 1976/7 is assumed to have been 20% higher than was in fact the case.[9] The second adjustment relates to relatively high 'efficiency' wage for mill-weaving and assumes that wage-bill in 1976/7 had been 40% lower than was in fact the case. For the handloom/powerloom enterprises, we made the following adjustments. The first one assumes that the differentials between ex-mill yarn prices and those paid by these units in 1976/7 had been the same as in 1975/6 when the match between yarn availability and demand was greater. This procedure implies that we recalculate income and surplus of handlooms/powerlooms using yarn costs in 1976/7 that were respectively 20% and 15% lower than they actualy were.

The second adjustment assumes that handlooms/powerlooms are provided with all recurrent imports used by them at the official exchange rate. We must note that small units do presently offset a part of the disadvantages of inegalitarian import-allocation via pricing of their product. Therefore, in case of import liberalisation assumed in the second adjustment, we can not presume the entire present gap between imported input and referantial import availability to show up in larger income and surplus. We assume that only 50% does so show up.

We can now examine the figures in Table VI. We find that after the first adjustment, while the relative inefficiency of mill-weaving falls some what, it still does not compare favourably with handloom units, no matter what is the basis of comparison. Within the small scale sector, however, the ranking of handloom

[9]This is certainly not unrealistic in view of what has been said earlier about the prices mills cloth was in fact fetching in 1976/7 at the level of the consumers.

and powerloom units, like on previous occasions, varies depending on the basis of discussion. Thus, while handlooms continue to overwhelmingly surpass the powerloom units as regards the capital-output ratio, the latter is ahead when it comes to the rate of surplus (compare Table VI, rows A(3) and A(5).

When we add the second assumption, the relative superiority of small scale weaving in general to mill method to further confirmed, while the handlooms emerge as more efficient than both powerlooms and mills on all the bases of comparison considered so far.

TABLE VI

RELATIVE ECONOMIC EFFICIENCY OF SAMPLE TECHNIQUES AFTER ADJUSTMENTS FOR MARKET IMPERFECTION, 1976/7

Particulars	Sectoral		
	Handloom Units	Powerloom Units	Sample Mills
(A) First Adjustment			
1. Net output (Tk.mn.)	1.99	1.14	52.16
2. Net surplus (Tk.mn.)	0.15	0.48	—30.80
3. Capital/output (year)	1.24	3.85	6.90
4. Surplus/fixed capital (%)	8.42	12.79	—12.00
5. Surplus/total capital (%)	6.10	10.95	—8.6
(B) Second Adjustment			
1. Net output (Tk.mn.)	2.29	1.26	51.92
2. Net surplus (Tk.mn.)	0.45	0.60	—30.58
3. Capital/output (year)	1.07	3.49	6.90
4. Surplus/fixed capital (%)	25.8	15.96	—11.9
5. Surplus/total capital (%)	18.4	13.7	—8.5

Sources : Data from the sample surveys.

It is to be noted that the excess of the average handloom enterprise over and above the powerloom unit in (i) output-capital ratio and net surplus-capital ratio, after the effects of the imperfections of the markets for yarn and imports have been adjusted as presented in Table VI, was found to be significant at 5% level of significance. The superiority of the average handloom unit to the mill is even greater, as the latter is saddled with a negative rate of surplus. Finally, we made some calculations about relative marginal capital-output ratios for handlooms and mill enterprises for 1976/7. The conclusions reached on the basis of average capital output ratios alone were entirely unaffected.

It may be of some significance that it is only the average handloom unit that is found to achieve in excess of 18% on total capital after reasonable adjustments have been made for market imperfections, and that this rate of surplus closely approximates what some economists have regarded as the social opportunity cost of capital in LDCs.[10]

Some Explanations for the Observed Efficiency Pattern

We must now attempt to explain our findings about the relative efficiency of alternative techniques. The rather unfavourable performance of mill-weaving cannot be ascribed to the particular measurement framework, or the definitions underlying them. This, it seems, has instead to be ascribed (a) to our use throughout of the measuring rod of the economist, as against that of the accountant, and (b) to causes of inefficieney at possibly fundamental levels. A brief discussion of these two aspects of the situation, in that order, is apposite here.

The use of economic concepts for measuring, say, net output (e.g, netting out stock appreciation), or capital replacement costs can sometimes unravel the real situation. In particular, the use of replacement cost, as opposed to the very much lower written-down historic cost (thanks to the effect of the accelerated depreciation provision), as the basis for depreciation has apparently depressed net output and surplus relative to what they otherwise would have been. The more automated and elaborate the equipment are, the more penalising (in efficiency terms) would be any failure to extract high levels of physical output per unit time. This is precisely what is happening. Further, while utilisation in the mills remains very low, this negative factor is aggravated by relatively large managerial overheads of a bureaucratic public sector holding company, the BTMC.

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[10]Pack has recently conducted some calculations for the cotton textile industry in the LDCs. using a rate of return of 19.5% per annum [10, p.324].

As for the more fundamental causes keepingweaving productivity in the mills low, we have in mind those that are perhaps due to errors (a) of plant-planning, and (b) of equipment purchase. Unfortunately, there is no published sources which shed light on those two important causes of inefficiency.And yet, it seemed to this author from his interviews with the managers that these two are non-trivial causes of weaving inefficiency. In the circumstances, the discussion is bound to appear at places a bit conjectural. Planning of industrial projects, in particular industrial engineering, as a specialised area of management did not develop in Bangladesh. It is outside the scope of this paper to explain why. Very briefly, the Pakistani entrepreneurs, who dominated enterprise upto 1971, regarded Bangladesh as a *defacto* colony, the surplus of which was to be extracted given the lowest possible overall investment, especially investments that spin off useful technological knowledge to the Bengalis. Academic and research facilities which would have raised the standard of the practice of industrial engineering in Bangladesh thus remained very low (for a statement to this effect in a broadly related context, see [5, p. 4]. It can be reasonably supposed that each large scale industry had its own share of planning inefficiencies. Perhaps, in the cotton textile industry they were weighted to the detriment of weaving, because of its secondary nature.

As for the errors at the level of the purchase of equipment, we like to mention two things. First, most equipment imports were financed by tied aid. Of course, it is known that tied aid is often seen as a donor-nation effort to take institutionalised advantage of the absence in the LDCs of their own capital-goods industries, by disposing off produced equipments which may be (a) faulty in design or manufacture, or (b) simply re-conditioned, although the prices charged may be comparable to those for new equipments. True, when outright used equipment can be optimal for the LDCs in the cotton textile industry [10], even reconditioned or faulty equipments can be better than nothing. However, given the way the importation of capital goods in the Pakistani era used to be conducted, there frequently were collusive dealings between the private foreign equipment suppliers and the private large industrialists. This usually related to import over-invoicing [18]. Without the complicity of the former, capital goods over-invoicing was impossible. Since the gains were large, what is sometimes euphemistically call "deals" were usually made. The private foreign equipment supplier could supply equipment in poor condition with impunity. In return, he would deposit the proportion of the declared value accounted for by over-invoicing usually in secret back accounts. How could the import of poor equipment into the cotton industry be selective towards weaving? This may have been due to a perception of mill-weaving as only of secondary importance, which was shared both by the government and the mill-promoters.

CONCLUSIONS

One frequently has to make judgements about the relative desirability of alternative techniques using efficiency ranking generated in the context of the prevailing market environment. Because market environment conditions the distribution of entrepreneurial command over the requisite real resource which, in turn, is of critical importance to whether or not a given technique is approximating its efficiency frontier in terms of net monetary definition, a treatment of the distribution of entrepreneurship in its resource-acquiring aspects should be considered among essential preliminaries to the achievement of an *appropriate* efficiency ranking. This paper has posed some of the more important considerations in this regard. Drawing on the findings of a wider study it has concluded that, given the technique-selection mechanisms in Bangladesh, the association between an entrepreneur and his technique is perhaps more properly seen as a product of a social division of labour, not an individualistic, atomistic process of choice. It has further argued that the expression "social dicision of labour" can be quite meaningfully interpreted in terms of a conceptual refinement of what entrepreneurship is in respect of the functions that can be subsumed under it. There is, it has been further argued, a marked disproportionality among economic agents in the capacity to perform the resource-acquiring entrepreneurial fuuctions in a cost-reducing way which is the economic reflection of the forces of an unequal social division of labour.

On the level of paticular empirical findings the sample mills were found to have a modest superiority to the handloom and powerloom units in terms of cloth-output per loom in operation in both years studied. (However, the superiority is modest because (a) the proportion of loomage that is, on average, operated is lower in the case of the sample mills than for the handloom sample and, because the handloom units utilise their equipment more intensively to the mills, per unit time that is reported to be operational.) The mills, with elaborate machinery and management, are predictably penalised, owing to their failure to intensively utilise their capacities, in terms of having much higher capital-output ratio than are found for the handloom and, to a lesser degree, the powerloom units. The handloom units confirm their relative superiority when they record higher productivity for the recurrent imported input, as well as much higher rates of surplus on the capital employed. The sample mills are found, on average, to record negative rates of surplus in both years examined. (However, as partly-integrated enterprises, their *overall* performance concerning surplus generation is, thanks to the productivity of their spinning activities, not nearly

as dismal.) The handloom method was found to ramain markedly superior ta the mill method even after the effects of (quantitatively) important imperfections of fector and product markets were accounted for.

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Population Pressure and Agricultural Productivity in Bangladesh

by

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An attempt is made in this paper to understand the dynamics of the relationship between population pressure and agricultural productivity examining the change in the level of land-man ratio with the change in the level of land yield of the districts in Bangladesh during the period 1961-64 to 1974-77. It is hypothesized that land-man ratio will be inversely related to agricultural yield. The hypothesis is supported by data. However, this relationship becomes weak when districts are classified according to their yield levels. But the growth of labour force seems to be related with the growth of output, indicating a dynamic relationship between yield and population pressure. However, the direction of causation is not necessarily from 'population pressure' to higher productivity ; rather higher productivity also leads to higher density by attracting migrants from other non-developing areas. This movement of population from poor agricultural districts to districts of better agricultural performance has resulted in higher population density in high growth rate districts and lower density in low and negative growth rate districts.

I. POPULATION PRESSURE AND PRODUCTIVITY

It has frequently been observed that regions with higher density of population usually also have higher agricultural yield i.e., output per acre of cultivated land.[1]

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[1]Recently, some other benefits that less developed countries might enjoy from that high population growth/density have been identified. Grover and Simon [5] have found higher population density made a significant contribution to road building ; Simon [7] has established in a different study the positive effect population density has on agricultural saving in irrigation systems. Frederiksen has found a strong positive relationship between population density and households served by electricity [3]. These findings suggest that population growth or density may accelerate the process of economic development of the developing countries through building important infrastructure.

Population pressure may lend to higher productivity through intensive cultivation of land, by greater labour utilization resulting from greater availability of labour per unit of land, by bringing more fallow land under cultivation and by changes in agricultural practices or dropping pattern through important innovations in techniques of cultivation over time.[2] Some of the changes can already be observed in Bangladesh. According to one estimate, a major factor underlying increase (68%) in cereal output in Bangladesh over the period 1964-67 and 1976-78 was the shift of area from traditional to high yielding varieties of the cereal crops [6]. The increasing utilization of modern inputs in agriculture to raise food production may be treated as a response to the growing needs of increasing population.

However, the relationship between population pressure and productivity is not always unidirectional. It may be in either direction. While population pressure may lead to more intensive cultivation by employing more labour per unit of land, and in this sense may be viewed as an independent variable, one may also visualise it as a dependent variable in a different chain of causation. For example, higher agricultural yield may have a favourable impact on the net growth rate of population in some broad Malthusian way through several biologic mechanisms, such as diminishing the length of post-partum sterility (lactational amenorrhea), increasing fecundability or reducting the frequency of fetal wastage. Or, higher agricultural productivity may attract migrant labourers from other non-developing areas and this may also lead to increasing density of population in one area. In the above two cases, 'population pressure' may be treated as dependent variable to be explained through agricultural yield.

Although it is possible to have many important variations within each of the two broad causal schemes, there is, however, one important element common to both of them, which is the time scale pertaining to the explanation. The process of adaptation and diffusion of the new agricultural technology arising out of population pressure usually takes place over a long time span. For example, change-over from a long to a short-fallow system of cultivation induced by rising population pressure may take a long

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[2]How population pressure brings about changes in agricultural practice, through important innovations in techniques of cultivation overtime, has been well demonstrated by Boserup in her classical work [2]. Boserup in her book argued that the most important factor determining technical change in peasant agriculture has been, and is, increasing population pressure on the land.

time. Similarly, neo-malthusian scheme operating through natural population growth extends over generations and calls for explanation involving a secular process.

Our purpose here is to look at the relationship between population pressure/density and agricultural productivity by examining the change in the level of land-man ratio (measure of population density) with the chage in the level of land yield during the period 1961-1964 to 1974-1977, using district-level data.[3] In other words, the major thrust is to see how population density and agricultural yield react to one another within the relatively shorter run of a 13-year period. In the light of the arguments given so far we would expect an inverse relationship between population pressure and agricultural productivity. However, the time span of our study relates only to a period of 13 years since 1960. This makes all the secular or longer term adjustment mechanisms suggested earlier, somewhat inapplicable. Neither the density of population nor significant changes in agricultural practices, no matter whether treated as an independent or a dependent variable, can be expected to undergo significant adjustment within the relatively short span of 13 years. Therefore, we have been left with the task of defining the adjustment variables in such a way, as to be compatible with the time scale of our analysis. In other words, it requires re-ordering the important variables in terms of their relative speeds of adjustment. We have partially taken care of this problem. For example, two of our central variables—population density and agricultural yield have been defined as follows : Agricultural yield has been defined as value of output per acre. This definition reflects adjustment mechanisms such as cropping pattern and cropping intensity. These adjustment mechanisms, have undergone considerable change during the study period. Similarly, population pressure or desnsity of population is measured by male workers per acre. This definition incorporates into such adjustive mechanisms as inter district migration of male labour force and change in the occupation structure within a district over time. It will be seen later that there has been considerable inter-district migration during the period under consideration.

These definitions of key variables will help us to capture changes undergone in the adjustment mechanisms across the districts during the period under consideration.

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[3]A paper on the similar subject could be found in the context of Indian agriculture, see [1]. The present paper employs almost similar techniques of analysis and arguments as those of the Indian study. However, the present paper went beyond mere examining the statistical association between population pressure and agricultural productivity to looking at the causal mechanisms explaining the above relationships in more detail.

Data

For the present study, net-sown area, value of total agricultural output and number of male agricultural workers in each of the 17 districts of Bangladesh during 1961-64 in the sixties and 1974-77 in the seventies are the central variables of analysis. Here, we provide a brief description of the definitions used and the coverage of the study.

Choice of Years

The choice of years was made because 1961-64 are pre-green-revolution years whereas 1974-77 refer to a period when new technology was introduced in some parts of the country. This would help us to capture some of the changes brought about by the introduction of seed fertilizer technology. Three years' average has been taken during the sixties and seventies in order to reduce to a minimum the annual fluctuations in crop output.

Value of Agricultural Output

Average output of 19 crops for each of the 17 districts for the years 1961/62, 1962/63 and 1963/64 during sixties and 1974/75, 1975/76 and 1976/77 during the seventies was calculated from data collected by the Ministry of Agriculture. Three years average was calculated to allow for year to year fluctuation in crop output.

The total value of 19 crops'[4] output was obtained by applying average all Bangladesh constant 1976/77 prices for both the periods. These 19 crops accounted for approximately 95 per cent of gross cropped area in each district. We have also adjusted the output of 19 crops in order to account for the excluded crops. The value of output for each district was inflated accordingly on the assumption that the average productivity in the left out crops equals the average productivity of the 19 included crops.

Net Area Sown

The data on net area sown during 1961-64 and 1974-77 were obtained from the Agricultural Census Reports published by the Bangladesh Bureau of Statistics. We have taken "net area sown in acre" as our unit of land in view of our interest in finding the potential capacity of available cultivable land.

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[4]These crops include (a) cereals, (b) pulses, (c) oil seeds, (d) fibre crops and (e) other crops.

Workers

The data on male agricultural workers have been obtained from the population census of Bangladesh, 1961 and 1974. A better measure would have been total agricultural workers employed in each district. But ambiguities regarding the classification of women as to whether they are wtithin the labour force or within the 'housewife' category, makes it difficult to compare for all agricultural workers during 1961 and 1971. These ambiguities have resulted in changing the conomic status of women in households from those of workers in 1961 to housewife in 1974. As a result, we were constrained to use only male agricultural labourers in the two censues. We recognize that this is a poor alternative, since it fails to caputre genuine changes that have taken place in the participation rates of male and females. Utilizing census data in the mesure of labour force participation has other problems. Census data refer to the stock of labour force in the two corresponding periods of 1961 and 1974. However, one should ideally use flow measure (i.e., man-days of labour used per acre) in determining labour force participation. One could use stock data provided 'duration ratio' i.e., the number of days worked per male workers in agriculture per year, remained constant. But given the classificatory scheme of the census based on time disposition, it was not possible to make any inference about duration ratio. We had, therefore, no other alternative but to employ district-wise data, hoping that it will at least qualitatively capture the nature of change.

It may be noted here that our area and output data refer to the average for the years 1961-64 and 1974-77, whereas the male agricultural labour data pertain tol 961 and 1974. The mid-years for1961-64 and 74-77 are 1962/63 and 1975/76 respectively. We have, therefore, extrapolated the 1961 and 1974 male agricultural labour force for 1963 and 1976 basing ourselves on the average rate of increase in male agricultural labour force between the two census years 1961 and 1974.[6]

Growth Rates

Annual compound growth rates were calculated on the basis of three years' average value of area and output for the base period 1961-64 and the terminal period 1974-77.

[6]However, it may be mentioned here that the position of a district with respect to land-man ratio does not change appreciably even if we do not extrapolate the male agricultural labour force figures and treat the census figurs for 1961 and 1974 as mid-years for 1962/63 and 1975/76 respectively.

Land Man Ratio

It refers to the net area sown divided by male agricultural for each district, expressed in terms of 100 men. This measure is considered to be a better measure of population density with respect to agricultural production than is total land divided by male agricultural labourers: when considering agricultural production, it is resonable that land that is uncultivable because it is mountainous or marshy, be removed from the comparison of the various districts.

Labour Productivity

Total output divided by the number of male agricultural workers in each district.

II. FINDINGS

For the country as a whole, the agricultural output grew at the rate of 1.2 per cent per annum during 1961-64 and 1974-77, while the number of male agricultural labourers grew at a rate of 1.5 per cent per annum during the same period. In other words, the growth of output had failed to keep pace with the growth of labour force (male).[6] As a result, labour productivity has tended to remain more or less constant at about Tk. 2,600 per male agicultural worker during the sixties and the seventies (see Table I)

TABLE I

LAND YIELD, MALE PRODUCTIVITY, LAND-MAN RATIO AND OUTPUT DURING 1961-64 AND 1974-77 FOR BANGLADESH

Variables	Period		Annual Rate of Growth (compound)
	1961-64	1974-77	1961-64 1974-77
Land yield (Taka / Acre)	1615	1905	1.27
Male labour productivity (Taka Male worker)	2694	2598	—.28
Land-man ratio (Acre/Male Worker)	1.67	1.36	—1.58
Output (in million Taka)	33895.4	39565.3	1.19
Net area sown (in '000' acres)	20972	20767	—.08
Male workers (in '000)	12,577	15,229	1.48

[6]The growth of agricultural output lagged far behind the rate of population growth which was estimated to be around 3 per cent per annum during the period 1961-64 to 1974-77.

One of the important features of agricultural growth during the sixties is that almost all of it has been achieved through increase in yield per acre. We find that yield increased from Taka 1615 per acre in 1961-64 to Taka 1905 per acre in 1974-77, but total net area sown in Bangladesh decreased slightly from 209.72 million acres in 1961-64 to 207.67 million acres in 1974-77.[7] Thus for a total growth rate of output of 1.79 per cent per annum, yield per acre increased at a rate of 1.27 per cent per annum and net area sown declined at a rate of .08 per cent per annum.

One of the consequences of an increasing labour force on an unchanging or declining cultivable area has been a continuous decrease in the land-man ratio. This ratio declined from 1.67 acre per male workers during the sixties to 1.36 acre per male worker during the seventies. The increase in the yield on the one hand and decline in the land-man ratio on the other, has produced a negative relationship between the above two variables. This can be clearly seen from regression equations obtained by fitting double log functions between yield and land-man ratio for the years 1961-64 and 1974-77 (Table II).

TABLE II

REGRESSION OF LAND YIELD ON LAND-MAN RATIO : 1961-64 TO 1974-77

Year	N	Dependent Variable	Independent Variable	Intercept	(Standardized) Regression Coefficient	Regresion Coeficient	R^2	t-ratio
1961-64	17	log land yield	log land-man ratio	4.27	—.7891	—.4809*	.62	5.03*
1974-77	17	log land yield	log land-man ratio	4.61	—.6467	—.6285*	.42	3.28*

*Significant at .01 level

Note : The regression equation fitted is of the following form :

$$\log Y = A + b \log X$$

where Y is adjusted value of output per acre of net area sown, and X is net area sown (in acre) per male agricultural worker.

[7]This absolute shrinkage may arise out of diversion of some cultivable land to construction of new houses to accommodate growing number of population, land erosion brining more and more rural land under urban habitation.

We find that land yield is inversely related with land-man ratio with a negative elasticity. This relationship is statistically significant and holds good for the sixties and seventies separately. A comparison of the two equations gives us an opportunity to hypothesize about the dynamics of the relationship between land-man ratio and land yield. We find that the intercept terms remained more or less unchanged while the elasticities of land-man ratio with respect to land yield increased from —.48 in 1961-64 to —.63 in 1974-77.[8] It implies that given the same unit of land-man ratio, its impact on land yield is more pronounced in the seventies than in the sixties. This may be attributed to absolute difference in the level of land-man ratio during the periods of 1961-64 and 1974-77. The pressure on land increased over the years as reflected in decreasing land-man ratio and this has resulted in higher productivity. This finding shows the existence of a dynamic relationship between increase in land yield and a compensating decrease in land-man ratio.[9]

In order to explore this dynamic relationship between change in yield per acre and corresponding change in land-man ratio, we further look at the more disaggregated picture, classifying districts according to the growth of output. Here, we maintain that the relationship between yield and land-man ratio will hold true when regions are defined according to their growth rates; and this relationship becomes weak or non-existent when districts are classified according to their yield level. We therefore, hypothesize that the relationship between yield and labour pressure or density is not a static but a dynamic relationship.

In order to test the above hypothesis, we have classified 17 districts, according to the rate of growth of their output. Districts are also classified by growth of land-yield. Finally, we shall explore if the relationship referred

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[8]The elasticities calculated at the mean values of land yield, with respect to land-man ratio are Taka 8 and 12 for the sixties and seventies respectively. In other words, at the mean value of land yeild one per cent decrease in density (i.e., land-man ratio) leads to an increase in productivity (i.e., land yield) by Taka 8 and 12 in 1961-64 and land yield by Taka 8 and 12 in 1961-64 and 1974-77 respectively.

[9]It is difficult to obtain meaningful results by regressing the growth rates of one variable with the growth rates of the other, because of differences in the initial levels in growth rate calculations. Instead, dynamic relationships can be inferred by comparing the initial and end year regression results, carried out on the levels of the relevant variables, at two points of time.

to above holds true for districts when classified according to their yield levels.

Classification of Districts by Growth of Output and Labour Productivity

Table III presents data on the distribution of all districts in Bangladesh according to their rate of growth of output, along with the percentage share of each crop in the net area sown, agricultural output, and male workers in agriculture as in the terminal period 1974-77.

TABLE III

PERCENTAGE DISTRIBUTION OF AREA AND AGRICULTURAL OUTPUT AND PRODUCTIVITY LEVELS BY GROWTH OF OUTPUT : 1961-64 TO 1974-77

Growth Rate (Annual Compound) %	Terminal Period 1974-77						
	Number of Districts	Net area Sown (NAS) %	Output %	Male Worker %	Yield (Taka/ Acre)	Male Worker Productivity (Taka/M. Worker)	Land Man Ratio (Acre/M.Worker)
Above 1.50	7	41.97	47.22	42.80	2144	2867	1.33
0.50-1.49	8	42.91	40.89	43.49	1815	2443	1.35
Negative Growth	2	15.11	11.88	13.70	1497	2252	1.50
Total	**17**	**20767**	**39565**	**15229**	**1905**	**2598**	**1.36**
		('000 acre)	**(ml Taka)**	**('000)**			

The mean growth of output for the country during 1961-64 to 1974-77 was 1.19 per annum as mentioned earlier. However, we find from Table III that there are 7 districts that recorded higher growth rates, exceeding 1.50 per cent per annum, and 8 districts that had an average growth rate ranging between .50 and 1.49 per cent. In addition, there are two districts which had negative growth rates.

The 7 high growth districts account for 42 per cent of total area, 47 per cent of total output and 43 per cent of male labour force. Consequently they are characterised by both above average yield and above average male labour productivity. The land man ratio in these districts is also lower than the national averge.

As against this, the two negative growth districts present a dismal picture. They account for nearly 15 per cent of the area and 14 per cent of labour force but produce only 12 per cent of national output. Consequently, the land yield and labour productivity achieved by these districts is significantly lower than the national average.

The 8 mid-growth districts are characterized by average labour productivity, land yield and land-man ratio.

So far we have presented only a static picture of the above three groups of districts during 1974-77. It would be more interesting to determine how in these very districts labour productivity, land yields and land-man ratios have changed as a result of differential rates of growth over the period 1961-64 to 1974-77. The details are given in Table IV.

TABLE IV

LAND YIELD, MALE PRODUCTIVITY AND LAND-MAN RATIO DISTRICTS CLASSIFIED BY THEIR GROWTH OF OUTPUT : 1961-1964 TO 1974-77

		1960	1970	1960	1970	1960	1970	Annual Rate of Growth (Compound) 1961-64 to 1974-77				
Growth Rate Annual Compound %	Number of Districts	Yield Tk./Acre	Yield Tk./Acre	Male Productivity Tk/M.W.	Male Productivity Tk/M.W.	Land Man Ratio (Acre/M.W.)	Land Man Ratio (Acre/M.W.	Output	NAS	Yield	Male Workers	Male-Labour Productivity
Above 1.50	7	1647	2144	2659	2867	1.61	1.33	2.21	0.15	2.05	1.60	0.58
0.50-1.49	8	1562	1815	2657	2443	1.70	1.35	0.87	—.32	1.16	1.54	—0.64
Negative	2	1689	1497	2908	2252	1.72	1.50	—1.15	—.24	—0.92	0.80	—1.95
Bangladesh	12	1615	1615	2694	2598	1.67	1.36	1.19	—.08	1.27	1.48	—0.28

Note : M.W.—Male worker productivity.

One very important result that emerges is that the land-man ratio has declined substantially in all growth rate categories. This is a reflection of fast growing agricultural labour force being absorbed on constant land area all over Bangladesh.

Looking at the 7 high growth districts one finds that both their land yield and labour productivity have recorded substantial increase. Land-man ratio in these districts has also declined rapidly.

The average growth rate of output for 7 high growth districts works out to be 2.21 per cent per annum. That yield is the major source of growth is clear from the fact that whereas yield increased by 2 per cent, net area increased only by .15 per cent. It, therefore, shows that rapid growth of output is associated with a very large increase of labour force, consequently with a fairly sharp decline in land-man ratio. It indicates that growth centres in agriculture is also sucking work force at a rapid rate. Compared with the average national growth rate of agricultural male workers of 1.48 per cent, the male labour force increased at an average rate of 1.60 per cent in these high growth districts. However, since output growth rate was a little higher, labour productivity has still shown a positive growth rate.

There has been very little change in land yield and labour productivity in the 8 mid-growth districts. In these districts, all increases in output seem to have been eaten away by increases in the labour force.

In the negative growth districts, wheras yield level has declined only marginally (from Taka 1689 per acre during the 60's to Taka 1497 per acre during the 70's), labour productivity has recorded a much sharper fall (from Taka 2908 per male worker to Taka 2252 per male worker). With a substantial decline in output, not being compensated by equally sharp fall in the growth of labour force, their male labour productivity has decreased at a high rate of 2.0 per cent per annum. However, it should be noted here that the negative growth districts, have had the highest land-man ratio and also experienced slow growth rate in labour force, compared with the national level. These findings possibly suggest that the reverse process of labour force being pushed out of declining agriculture, is taking place. We, therefore, find that both *push* and *pull* factors are operating in Bangladesh agriculture. This issue will be further dealt with in a later section of the paper.

Growth of Land Yield

We have also examined the relationship between land-man ratio and productivity by growth of land yield during the period 1961-64 to 1974-77. (Table V). It may be noticed that the results obtained from a study of growth of yield is more or less similar to that presented by growth of output discussed earlier (Table IV). This indicates that for most districts, the main determinant of output growth has been increasing yield levels, linking growth rates of output and yield in a strong positive manner.

TABLE V

PERCENTAGE DISTRIBUTION OF AREA, AGRICULTURAL OUTPUT AND PRODUCTIVITIES BY GROWTH OF YIELD : 1961/64 to 1974/77

Growth Rate of Yield (Annual Compound % 1961-64 to 1974-77	Number of Districts	Net Area Sown (NAS) %	Output %	Terminal Period 1974-77			
				Male Worker %	Yield Taka/ Acre	Male Worker Producti-vity /Taka/ M.Worker	Land Man Ratio (Acre) M.Worker
Above 1.50	8	48.53	52.91	50.63	2077	2715	1.30
0.50—1.49	7	36.35	35.20	35.66	1845	2565	1.38
Negative	2	15.11	11.88	13.70	1497	2252	1.50
Bangladesh	**17**	**20767** ('000 acre)	**395653** (ml. Taka)	**15229** ('000)	**1905**	**2598**	**1.36**

The figures in Table V clearly show a strong relationship between levels of yield and population desnsity. From those findings, one may possibly hypothesize that there extists a positive relationship between growth of land yield and growth of labour foice in agiiculture.

Classification by Levels of Land Yield and Labour Productivity

It may be pointed out here that output growth figures ignore initial yield levels. The high growth districts, for example, may include both those areas where the initial yield level was very high and also those where it was extremely low. The same may be true for medium and negative growth districts. In order to account for this difference in levels of yield, it is desirable to test whether the relationship between yield levels and population that holds true for districts when classified according to their rates is also observed when classification is made on the basis of their yield levels. The question here is whether growth of output is the main determinant of the suction mechanism or whether level of yield by itself is the main causal factor.

TABLE VI

PERCENTAGE DISTRIBUTION OF AREA, AGRICULTURAL OUTPUT AND PRODUCTIVITIES : 1961-64 YIELD LEVELS

Yield (Taka/Acre)	Number of Districts	Net Area Sown (NAS) %	Output %	Male Workers	Yield Land Productivity (Taka/Acre	Male Worker (Labour) Productivity (Taka/Male Worker)	Land-Man Ratio Male Worker
Above 1750	5	27.05	31.04	30.99	1854	2699	1.45
1500—1750	5	36.25	37.11	36.71	1655	2724	1.64
<1500	7	36.69	31.84	32.29	1403	2657	1.89
Total	**17**	**20972**	**33895.4**	**12577**	**1615**	**2694**	**1.67**
		('000 acre)	**(ml.Taka)**	**('000')**			

Table VI presents data on the levels of land yield of districts during 1961-64 in three classes (Table VI). We find that the average yield during the sixties was only Taka 1615 per acre, while only 5 districts had achieved a substantially higher yield level exceeding Taka 1750. There were 5 districts which had medium yield between Taka 1500 and Taka 1750, and 7 districts with yield less than Taka 1500 per acre. The most striking finding of Table VI is that there is no significant variation in male labour productivity among districts having different levels of yield. However, the high yield districts with only 27 per cent of net sown area were supporting 31 per cent of the total male labour force. This relative burden of labour on land is less acute in medium and low yield districts.

Table VII presents estimates of the rate of growth of land yield and productivity of male workers during the period 1961-64 to 1974-77.

TABLE VII

LAND YIELD, LABOUR PRODUCTIVITY AND LAND-MAN RATIO DURING 1961-64 and 1974-77 : OF 17 DISTRICTS CLASSIFIED BY THEIR LAND YIELD DURING 1961-64

Yield (Tk/Acre 1961-64	Yield	Male Productivity	L/M Ratio	Yield	Male Productivity	L/M Ratio	NAS	Output	Male Workers	Yield	M.W. Production	Land Man Ratio
<1500	(7) 1403	2657	1.89	1725	2575	1.49	—.18	1.41	1.6o	1.60	—.31	—1.89
1500—1750	(5) 1655	2724	1.64	1985	2662	1.34	—.07	1.28	1.47	1.40	—.23	—1.60
>1750	(5) 1854	2699	1.45	2038	2545	1.24	.03	0.73	1.21	0.66	—.47	—1.24
Total	**(17) 1616**	**2695**	**1.66**	**1905**	**2598**	**1.36**	**—.08**	**1.19**	**1.48**	**1.27**	**—.28**	**—1.58**

Note : The figure in parenthesis refers to number of districts.

It may be observed from the above table that the rate of growth of land yield is highest among the intial low-yield districts, followed by medium-yield districts and then the high yield districts. This may be attributed mostly to differences in the initial levels of yield. Even though the rate of growth of land yield of districts showed an inverse relationship with their initial level of yield, the yield per acre (or land yield) in 1974-77 is still highest for the initial high yield districts, followed by medium and low yield districts. The productivity of workers decreased in each category of districts irrespective of their initial yield level. This is due to failure to raise output above the level of growth of workers. It will be seen that, whereas the 7 initial low-yield districts recorded significant increase in land yield, productivity of workers decreased over this period. This is because, even though output increased at the rate of 1.41 per cent, the number of workers increased at the rate of 1.66 per cent. A similar trend is noticed for the other categories of districts.

It is clear from the above analysis that the land yield classification fails to reveal substantial changes in the relationship between land yield and over the period 1961-64 to 1974-77.

This confirms our earlier contention that the relevant classification for this relationship is differential rates of growth and not yield levels. Yield and labour force do not seem to be related *per se*, but the growth of labour force seems to be related with the growth of output, which in turn is positively related to the growth of land yield.

Population Pressure and Agricultural Productivity : Direction of Causality

Data presented so far demonstrate that there exists an inverse relationship between land-man ratio and agricultural productivity. In othei words, the lower the land-man ratio (i.e., higher population pressure), the higher the agricultural productivity (i.e., higher output/yield per acre of cultivated land). This relationship is not static but dynamic in nature i.e., changes in the level of land-man ratio is also related with the changes in the level of agricultural productivity. The causal mechanisms through which population may lead to higher productivity may include cropping intensity and other land-augmenting activities such as higher application of chemical fertilizer per acre of land, expansion of acreage under high-yielding varities (HYVs) and irrigation, etc. It is found that cropping intensity, proportion of cultivated land given to HYV, proportion of land irrigated and application of chemical fertilizer per acre of land are inversely related to land-man ratio (Appendix Table A.1), and positively related to land yield

(Appendix Table A.2). This is, however, only one side of the picture of the two-way causation between land-man ratio and land yield. As we have mentioned erlier, high agricultural productivity may also lead to higher land-man ratio through several socio-biologial mechanisms. It is, therefore, desirable to examine the extent to which land-man ratio is affected by agricultural productivity.

The growth pattern of the districts suggests a relationship with density (Table VIII). In rural areas, high density districts which are also the districts experiencing the highest growth of agricultural output had an average population growth of 39 per cent during the inter-censal period 1961-74. This is higher than that of the national average which was 35 per cent. Population growth in low density districts which are also the districts experiencing the lowest growth of agricultural output), on the other hand, averaged only 27 per cent. In other words, the relative growth of high density rural districts was 30 per cent higher than that of low density rural districts. The medium and low-medium density districts (which are also the districts experiencing medium to low medium growth of agricultural output) had a population growth of 36 per cent each.

The factors responsible for these growth differentials are related obviously to varying levels of births, deaths, and net migration between districts. High density districts with higher levels of land-yield per acre would be expected to have higher levels of nutritional status. Better nutrition could be associated with higher fertility by serveal biologic mechanisms : diminishing the length of post-partum sterility (lactation amenorrhea), increasing fecundability or reducing the frequency of fetal wastage [4]. In addition to enhanced biologic capacity to reporoduce, high density districts also may have higher fertility because of socio-economic factors. Unfortunately, fertility and mortality estimates for Bangladesh by regions are entirely lacking. In the absence of reliable estimates of fertility by region, we have employed child-woman-ratio to see whether fertility level of a region varies with the level of agricultural output (as also with level of density).

It can be seen form Table VIII that the districts which have experienced high rate of growth of agricultural output (i.e., those with high density) also have higher child-woman ratio, followed by the districts with medium and low rates of growth of agricutural output (i.e., those with medium and low density). The differences in child-woman ratio between medium growth rate districts are not large compared to the differences in child-woman ratio between the high and low growth rate districts. This pattern

of relationship persists even when child-woman ratio is measured under various assumptions. However, these differences in child-woman ratios among districts of various rates of growth of output (or densities) are not staistically significant.[10] The data, although limited, do not provide any conclusive evidence of higher fertility in high growth rate districts (i.e., districts with high density) arising from biological factors. We, therefore, reject the hypothesis that high land-man ratio (or high density) in disrtrict with higher levels of land yield per acre is caused by better nutritional status of these districts.

TABLE VIII

CHILD-WOMAN RATIO OF DISTRICTS BY GROWTH OF AGRICULTURAL OUTPUT, 1961-64 TO 1974-77 (FOR RURAL AREA ONLY)

Growth Rate of Output (Annual Compound)	Child-Woman Ratios (1974) ; CWR-1			
	(1)	(2)	(3)	(4)
2—3	671	935	901	998
1—1.99	670	935	879	985
<1.00	669	937	887	987
Negative	654	922	878	983
Growth Rate of Output (Annual Compound)	**Child-Woman Ratios (1974) : CWR-2**			
	(1)	(2)	(3)	(4)
≥ 1.50	667	937	889	992
.50—1.49	672	934	885	987
Negative	654	922	879	983
Bangladesh	668	933	886	988

Note : Child-Woman ratio refers to number of children in the age-group 0-4 to women in the reproductive age-group, multiplied by 1000. Differences in the child-woman ratios (CWR) presented above are as follows. The numerators for all the CWRS' are the same i.e., children in the age-group 0-4, while the denominators differ. The denominators for CWR-1, CWR-2 are number of women in the age-group 10-49 and 15-45 respectively ; while the denominators for CWR-3 and CWR-4 are ever-married women in the age-group 10-49 and 14-55 respectively.

[10]As determined by one-way analysis of variance with unequal cell frequencies.

TABLE IX

LIFE-TIME NET MIGRANTS, POPULATION GROWTH, PRODUCTION OF LAND GIVEN TO HIGH-YIELDING VARIETIES (HYV) OF RICE AND CROPPING INTENSITY BY GROWTH OF AGRICULTURAL OUTPUT : 1961-64 TO 1974-77

Growth Rate (Annual Compound %	No. of Districts	%Population Change (rural) 1961/74	Life-time* Net Migrants both (sexes)	(males only)	Per cent of Net Sown Land given to HYV in 1976/77	Croppoing Intensity** (1976-77)	Per cent of Total Cropped Land Given to HYVin 1976/77
2—3	5	38.48	+125051	+63,669	25.51	159	16.04
1—1.99	6	36.15	+ 42580	+27,956	15.49	147	10.55
<1	4	36.32	– 102178	–52,356	13.09	143	9.17
Negative	2	26.74	– 65453	–39,269	6.95	142	4.81
Bangladesh (Rural)	17	35.28			16.01	148	10.79

Note : *Life-time migrants : persons enumerated in a place different from the place of birth

+indicates net in-migrants in the districts.

-indicates net out-migrants from the districts.

$$**\text{Cropping intensity} = \frac{\text{Total cropped land}}{\text{Net Area sown}} \times 100$$

The relevant data are presented in Table VIII.

Mortality levels would also be expected to vary with geographic location and density. Better nutrition in high density districts (i.e., districts with high rate of agricultural outputs) could result in lower levels of mortality, particularly among vulnerable infants and children [8]. Unfortunately, we have no data to provide any clue to the above proposition.

Although varying levels of fertility and mortality may account in part for the observed differential rates of growth between districts, the magnitude of the differentials suggests the movement of population plays a more important role. Some support to this hypothesis is provided by data presented in Table IX.

It can be seen from this table that the districts which have experienced the highest rate of growth of agricultural output (i.e., districts with high density) also experienced highest net in-migration. The next in order receiving net in-migrants are the districts experiencing medium level of growth (1—1.99%), whereas the districts which have experienced less than the one per cent and negative rate of growth of agricultural output are the net loser of population (i.e., out-migration out-weights in-migration). It provides a strong evidence to suggest that there exists an overall pattern, a kind of 'Suction Mechanism', by which high-yield areas seem to attract relatively larger proportion of labour, even within a relatively short period. On the other hand, districts with poor agricultural performance seem to be pushing out labour into higher growth districts on a very large scale. representing, so to say, the "mirror image" of high growth districts. We, therefore, find that the lower yield of the poorest districts are associated with a reduction in the population pressure in the form of a fall in the number of male workers per acre. This presents an interesing obverse case of the suction phenomenon.

Shifts in occupation structure within a district could also be a component of the suction mechanism. But this is not the case. The Table X provides no impressive evidence of regional variation in change in occupation structure during the intercensal period (1961—1974).

TABLE X

NUMERICAL AND PERCENTAGE DISTRIBUTION OF MALE CIVILIAN LABOUR FORCE (10 YEARS AND ABOVE) EMPLOYED IN AGRICULTURE IN 1961 AND 1974 BY GROWTH OF AGRICULTURAL OUTPUT OF DISTRICTS, 1961-64 TO 1974-77

	1961		1974		
Growth Rate of Output (Annual Compound)	Number	Per cent of Male Population 10 Years and above	Number	Per cent of Male Population 10 Years and above	Linear Intercensual Growth Rate (per annum) %
2—3	2758682	79.31	3378102	68.54	1.56
1—1.99	5427173	78.99	6713981	70.67	1.64
<1.00	2408420	78.33	2797432	64.70	1.15
Negative	1858153	79.50	2073105	66.75	0.84
Bangladesh	**12452428**	**79.01**	**14962620**	**68.45**	**1.41**

III. SUMMARY AND CONCLUSION

An attempt is made in this paper to understand the dynamics of the relationship between population pressure and agricultural productivity by examining the change in the level of land-man ratio (measure of population density) with the change in the level of land yield (i.e., value of output per acre of land) of the districts in Bangladesh during the period 1961—64 to 1974-77. It is hypothesized that land-man ratio will be inversely related to agricultural yield. We have tested the hypothesis using regression technique by fitting double log functions between yield and land-man ratio. The hypothesis is supported by data. The negative association between yield man ratio holds not only for the country as a whole, but also generally, for regions classified according to their growth of output and yield during the *sixties* and *seventies*. However, this rlationship becomes weak or non-existent when districts are classified according to their yield levels. In other words, yield and labour force do not seem to be related *per se*, but the *growth* of labour force seems to be related with the *growth* of output, which in turn is positively related to the growth of land yield. It shows that there exists a dyamic relationship between yield and population pressure. At the same time examination of the intercensal growth pattern of districts suggests a positive relationship with density. This observed differential rates of population growth between districts is mostly due to movement of population from poor agricultural districts to districts of better agricultural performance. This has resulted in higher population density in high growth rate districts and lower density in low and negative growth. Therefore, the direction of causation is not necessarily from 'population pressure' to higher productivity ; higher productivity also leads to higher density by attracting migrants from other non-developing areas.

The district-wise study suggests three very significant characteristics of the overall "suction phenomenon"; (a) it seems that geographical migration of labour has been the dominant form of adjustment; (b) this adjustment is more meaningful in the context of Bangladesh in districts where rise in yield level rather than net area sown has been the main source of agricultural growth because that is the viable mechanism for labour absorption in Bangladesh agriculture; (c) since geographical migration of labour has been the dominant form of sanction the suction process of labour into agriculture has been a perfectly reversible process. In other words, labour is being pushed out from districts of poor agricultual performance and they are being absorbed in high growth districts. It shows that both "push"

and "pull" factors are operating simultaneously in rural Bagladesh explained by agricultural performance, among other factors. From the above it appears that job opportunity affects labour mobility. The causation is evidently not Malthusian, but depends on creation of new job opportunity.

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Appendix

TABLE A-1

REGRESSION OF LAND-MAN RATIO ON CROPPING INTENSITY ; PROPORTION OF LAND GIVEN TO HYV ; PROPORTION OF LAND IRRIGATED, APPLICATION OF CHEMICAL FERTILIZER PER ACRE OF LAND, 1974-77

Equation No.	N	Dependent Variable (Y) 1976/77	Independent Variable (x) 1974-77	Beta (Standarized regression coefficient)	Regression Co-efficient (i.e., elasticity for log regression)	R^2	t-ratio
1	17	log cropping intensity	log land man ratio	–.4965	–.2764	24.65	2.21
2	17	log land irrigated	as above	–.6060	– 1.9794	36.82	2.95*
3	17	log land given to HYV	as above	–.6048	–3.1283	36.58	2.95*
4	17	log consumption of fertilizer per acre of cultivated land	as above	–.5389	–2.0288	29.04	2.47**

*Significant at .01 level, **Significant at .05 level.

Note : Equaton 1 = log Y = a + b logX where Y = Total cropped land/net area sown X 100 ; X = land-man ratio,

Equation 2 = log Y = a + b log X where Y = 1/C i.e., proportion of net sown land that is irrigated ; X = as above,

Equation 3 = log Y = a + b log X where Y = proportion of net sown land that is given to high yielding variaties ; X = as above,

Equation 4 = log Y = a + b logX where Y = application of fertilizer (ton) per acre of land (net sown land) ; X = as above,

TABLE A.2

REGRESSSION OF YIELD PER ACRE OF LAND ON LAND-MAN RATIO; CROPPING INTENSITY, PROPORTION OF LAND GIVEN TO HYV, PROPORTION OF LAND IRRIGATED, UTILIZATION OF CHEMICAL FERTILIZER PER ACRE OF LAND 1974-77

Equation No.	N	Dependent Variable (Y)	Independent Variable (X)	beta (Standardized regression coefficient)	Regression Coefficient (i.e., elasticity for log regression)	R^2	t-ratio
1	17	log land yield	log cropping intensity	.5000	.8765	.2500	3.29*
2	17	log land yield	log land irrigated	.7057	.2103	.4980	3.85*
3	17	log land yield	log land given to HYV	.8086	.1516	.6538	5.32*
4	17	log land yield	log consumption of fertilizer	·6974	.1801	.4864	3.76*

Note : The same as in Table A.2

*Significant at .01 level.

Note

Estimation of Regional Production Function: An Application to Survey Data in Bangladesh Agriculture

by

QUAZI SHAHABUDDIN*

I. INTRODUCTION

Production function analysis using farm-level data represents an integral part of any study dealing with the problem of resource allocational efficiency in a peasant agriculture. In fact, cross section production functions have been extensively used in many studies to generate the technological information (technical coefficients of production) necessary for analysing resource allocation behaviour of the farm-households in underdeveloped agriculture. In most such studies, however, an issue which features rather prominently in the context of estimation of cross section production function has not been adequately explored.

This relates to the regional nature of production function for various crops grown in different parts of the country. In many of these countries, there exists considerable diversity in the climatic as well as other factors governing the physical conditions of production. Not only are there significant differences in the soil characteristics among different regions, the incidence of rainfall particularly its seasonal distribution, displays considerable interregional variations as well. Thus, to the extent different regions of a country are characterized by such heterogenuity, it becomes necessary

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to explore the differential nature of production functions across different regions.

This paper, therefore, attempts to analyse the regional nature of agricultural production functions for different crops using field survey data collected in Bangladesh.

II. DATA AND METHODOLOGY

The source of information used in this study is a field survey conducted by the author in the winter of 1979, in four selected regions in Bangladesh. The basic purpose of the survey was to collect information with respect to : (a) general characteristics of farm-households, and (b) input and output combination of various crops grown during the year preceding the survey. In the condition of the field survey, as stratified random sampling technique was adopted, the basic stratification being done on the basis of the ecology of Bangladesh. Based on a World Bank Sector Study on Land and Water Resources in Bangladesh, the following primary ecological regions were first identified, each possessing a distinctive climatic and hydrological characteristics.

(i) **The Eastern Region,** comprising of Sylhet Comilla, Noakhali, Chittagong and Chittagong Hill Tracts districts.

(ii) **The Northwest Region**, comprising of Dinajpur Rangpur, Pabna, Rajshahi and Bogra districts.

(iii) **The Southwest Region,** comprising of Kushtia, Jessore, Faridpur, Khulna, Barisal and Patuakhali districts.

(iv) **The Central Region,** comprising of Dacca, Tangail, and Mymensingh districts.

Subsequent stratification was done within each Region, i.e., sub-regions were selected on the basis of factors that makes atricultural production so risky in Bangladesh.[1] Among these factors the most prominent are : (a) variability in seasonal rainfall, and (b) incidence of floods and cyclones, using appropriate indices computed from the seasonal rainfall and crop damage data, the following subregions were selected from each of the ecological region for the conduction of field survey.

[1]Such a criterion was used in the selection of sub-region because this data-set also constituted the source of information of a more comprehensive study dealing resource-allocation behaviour of the small farm-households exposed to the yield as well as price uncertainty.

(i) **Sylhet** district in the Eastern Region
(ii) **Pabna district** in the Northwest Region
(iii) **Faridpur district** in the Southwest Region
(iv) **Mymensingh district** in the Central Region

Further sampling stratification was done in the selection of Thana in each subregion (two Thana selected in each district) based on cropping intensity as well as cropping pattern representative of the district concerned. In each of these selected Thana, four/five villages were selected randomly with the help of Random Number Table from the complete list of villages compiled from the 1974 District Census Report in Bangladesh. And finally, the farm-households were chosen randomly subject to the condition that the farm-size of the selected household did not exceed three acres, our accepted limit of farm-size for a small farm in Bangladesh. In all, 202 farm-households were interviewed, the number of households interviewed in each district remaining more or less the same at fifty. This also indicates that in each of the eight selected Thana, roughly 25 households were interviewed. The data were collected on a pretested questionnaire, prepared earlier to cover various aspects of farm-household operations with particular emphasis on covering detailed information input and output combination of various crops grown in the survey areas.

In order to test whether there exists significant regional differences in production functions in Bangladesh, we undertook a series of statistical tests examining the validation of a set of restrictions imposed across regressions representing different regions. More specifically, to carry out this exercise, the following three sets of production functions were estimated for each crop in different sampling regions in Bangladesh.[a]

(a) First, the production functions were estimated for various crops in each of the four sampling regions, to the extent that data were available, as shown in Table I.

TABLE I

Crops	Sampling Regions			
1. Aus Rice	Sylhet	Pabna	Faridpur	
2. Aman Rice	Sylhet	Pabna	Faridpur	Mymensingh
3. Jute	X	Pabna	Faridpur	Mymensingh
4. Pulses	X	Pabna	Faridpur	X
5. Wheat	X	Pabna	Faridpur	X

[a]The production functions estimated were of Cobb-Douglas type. Ordinary Least Squares was used throughout for estimating the reduction functions in log linear form.

This represents the set of regressions without restrictions as it allows differential slopes as well as intercept coefficients across different regions. (b) Secondly, production functions were estimated, for each crops, with pooled data across different regions and incorporating regional shift dummies to account for differences in the intercept coefficients in different regions. This represents the regression-set with the restriction of common slope coefficients across different regions.

(c) And, finally, the production functions were estimated with pooled data across different regions without incorporating any regional shift dummies. This represents the most restricted set of regressions in our exercise as it imposes the restriction of common slope as well as intercept coefficients across different regions.

III. FINDINGS

The empirical findings based on the tests are put in a tabular form in Appendix Tables A.1 A.2 and A.3, and are summarised in Table II.

TABLE II

Crops	Common Intercept & Slope	Null Hypothesis Common Intercept	Common Slope
1. Aus Rice	rejected at 1% level	rejected at 1% level	not rejected even at 5% level
2. Aman Rice	rejected at 1% level	rejected at 1% level	not rejected even at 5% level
3. Jute	rejected at 1% level	rejected at 1% level	rejected at 5% but not at 1% level
4. Pulses	not rejected even at 5% level	not rejected even at 5% level	not rejected even at 5 % level
5. Wheat	not rejected even at 5% level	not rejected even at 5% level	not rejected even at 5% level.

Our findings suggest the following :

(a) The Chow test rejects the Null Hypothesis of equality of both intercept and slope coefficients across region for Aus Rice, Aman Rice and Jute. For Pulses and Wheat, however, the Null could not be rejected even at 5% level of significance.

(b) The Dummy Variable Test (II) rejects, at 1% level, of the Null Hypothesis of equality of intercept coefficients assuming common slope coefficients across regions for Aus Rice, Aman Rice and Jute. Again, for Pulses, and Wheat, the Null Hypothesis could not be rejected even at 5% level.

(c) In case of Dummy Variable Test (III), the Null Hypothesis of common slope coefficients allowing intercept to vary across regions could not be rejected for any of the crops produced.

Based on the results of these tests, therefore, we may draw the following conclusions concerning the regional nature of production functions for various crops in Bangladesh.

(i) For Aus Rice, Aman Rice and Jute, the intercept coefficients are significantly different across regions but the slope coefficients are not. This, therefore, calls for estimation of production functions for these crops with pooled data across regions but incorporating regional shift dummies to account for differential intercept coefficients. These significantly different intercepts may reflect environmental differences across the four sampling regions.
(ii) In cases of Pulses and Wheat, the Null Hypothesis of common slope and intercept coefficients either together, or separately, could not be rejected at 1% level of significance. It is, therefore, not meaningful to speak of regional production functions for these two crops in Bangladesh.

Thus, to the extent that there does not seem to exist any significant differeces either in slope or intercept coefficients across regions, the production functions for these crops would appropriately be estimated with data pooled across regions and without incorporating regional dummies.

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Appendix

TABLE A.1

COMPUTED F-RATIO AND CRITICAL VALUES OF $F(V_1, V_2)$ WITH THEIR RESPECTIVE DEGREES OF FREEDOM FOR CHOW TEST (I)

Crops	Degrees of Freedom	Computed F-Ratio	Critical Values of $F(V_1, V_2)$	
			1% level	5% level
1. Aus Rice	(20,119)	2.27	2.03	1.66
2. Aman Rice	(30,140)	1.80	1.70	1.46
3. Jute	(20,44)	2.38	2.34	1.80
4. Pulses	(10,66)	1.43	2.62	1.98
5. Wheat	(10,27)	.42	3.07	2.21

TABLE A.2

COMPUTED F-RATIO AND CRITICAL VALUES OF $F(V_1, V_2)$ WITH THEIR RESPECTIVE DEGREES OF FREEDOM FOR DUMMY VARIABLE TEST (II).

Crops	Degrees of Freedom	Computed F-Ratio	Critical Values of $F(V_1, v_2)$	
			1% level	5% level
1. Aus Rice	(2,135)	11.45	4.61	3.00
2. Aman Rice	(3,164)	12.78	3.78	2.60
3. Jute	(2,61)	5.70	4.98	3.15
4. Pulses	(1.74)	1.71	7.02	3.98
5. Wheat	(1.35)	.64	7.54	4.13

TABLE A.3

COMPUTED F-RATIO AND CRITICAL VALUES OF $F(V_1, V_2)$ WITH THEIR RESPECTIVE DEGREES OF FREEDOM FOR DUMMY VARIABLE TEST (II)

Crops	Degrees of Freedom	Computed F-Ratio	Critical Values of $(v_1\ v_2)$	
			1% level	5% level
1. Aus Rice	(18,119)	1.35	2.03	1.66
2. Aman Rice	(27,140)	.68	1.74	1.49
3. Jute	(18,44)	1.88	2.37	1.48
4. Pulses	(9,66)	1.47	2.70	2.03
5. Wheat	(9.27)	(.42)	3.20	2.25

Book Review

Palanpur : The Economy of an Indian Village by C.J. Bliss and N. Stern (Oxford : Clarendon Press, 1982, Pp. 340. £15)

The present book, which is essentially the outgrowth of the authors' continuous nine-month stay from September 1973, through April 1974, in a remote Indian village in Western U.P.—is concerned with the study of rural markets and institutions from the perspective of theories of economic development. While this type of intensive 'micro' empirical studies can be useful in providing insights into the workings of agrarian economies and the behaviour of various actors involved therein, somehow or other this type of research venture has almost always been eschewed by mainstream economists (though it has always been very popular with other branches of social sciences—especially amongst sociologists, anthropologists, demographers and others). Though generalizing from a single village can be a misleading exercise, it can nevertheless start the beginning of an inductive process. Aware of this limitation, the authors did not venture any grandiose generalization or anything approaching that. On the contrary, they suggest that their work should be taken as a test case which should bring out certain suggestive features about rural economies, that—if considered interesting—should be tested else where for relevance. Given this modest objective, their work was immensely successful in bringing out some of the interesting contours of rural economies and arousing the interest of many in the intricacies of rural economies. While the authors' emphasis in the book is essentially empirical, they also provide the readers with some guidelines of recent theories, which include a succinct review of the theories of share-cropping, some models of labour allocation and some theories of farmer's resource allocation under uncertainty. Given this admixture of theory and empirices, the book should prove to be interest to a wide range of economists—both theoretical and applied.

The book is divided into ten somewhat uneven chapters (both in terms of size and complexity) with four appendices for technical materials. The first two chapters are devoted to a discussion of the background of the study-like a general description of the place, the various socio-economic characteristics of the population, the sampling procedure and the general methodology of data collection etc. Chapter three, where the reader gets a brief glimse of the authors' vantage as leading theoreticians, provides a synoptic review of theories of agrarian economies—the workings of various rental markets and the behaviour of various actors involved in them. Among the thoeries, they devote most attention to the question of sharecropping presumably because of the enigmatic haze that surrounds the institution. An important point that

seems to have emerged from their cryptic but elegent discussion of sharecropping relates to the contribution of Marshall in this regard: that the theoretical contribution of Marshall regarding sharecropping was much broader and richer than what has come to be christened as the Marshallian model. Their section on farmer's decision under uncertainty is very interesting and illuminating, though it may prove to be somewhat roughgoing for those who are uninitiated in this area. However, within its brief compass, they are able to show that these models can be of immense help in understanding some of the complex dimensions of rural markets, since much of the behaviour in the real world is characterized by various degrees of risk-aversion. While the discussion of Bliss and Stern on various markets is comprehensive, albeit relatively consise, one is struck by the omission of any reference to the issues of interlinked transactions, which is by now widely acknowledged to be an important feature of rural economies of developing countries. If one is not overtly agnostic about the morals of the interlinked transactions literature and the recently accumulated emprical evidence in this respect, one would suspect that this omission could be quite misleading at least for some of the later reported empirical exercises. Chapters four and five, which are devoted to a discussion of various markets at Palanpur, present us among the following interesting findings which are worth underscoring: First like many other areas of South Asia, the market for bullock services does not seem to exist at Palanpur (presumably because of excessive risk, moral hazards etc.). Secondly, the market transactions are not isolated and impersonal, rather individuals seem to transact simultaneously in more than one market without however these transactions displaying any feature of feudalism. Finally, their finding regarding the relevance of standard theories to sharecropping practices at Palanpur much to the delight of the theoreticians belaboring in this area—is a somewhat positive one for economic theory. They find that the standard literature, especially the supervision aspect of landlord—as emphasized by Marshall and Cheung—and the risk-sharing aspect of sharecropping—as suggested by Newbery and Stiglitz—are quite helpful in resolving many apparent puzzels that seem to mystify this much-maligned institution. Chapters six through eight give a discussion of the econometric results regarding inputs, outputs, and high-yielding varieties etc. Among the major findings that seem to emerge from their econometric investigations include the following : First, contrary to what is held in conventional wisdom, they find a direct relationship between farm-size and productivity, corroborating the existence of constant returns to scale. Secondly, they find that not only are input prices and marginal productivities unequal, they seems to diverge by a wide margin—a finding which is in sharp contrast with the received

wisdom of standard neo-classical theory. Bliss and Stern, however, did not discard the standard neo-classical theory in their offered explanation, but appeal to a more sophisticated version of it—that is, to the theory of producer's choice under uncertainty. Finally, again, much to the contradiction of the now-established conventional wisdom, they do not detect any differentials in the adoption of high-yielding varieties nor any assymetry in the distribution of gains among the rich and the poor. Chapter nine sums up the authors' reflection about the applicability of standard theory and their suggestions for future work. Although they give standard theory a somewhat clean bill of health, they are far from complacent: they note certain theoretical riddles which are to be addressed, including the questions of non-existence of bullock markets and the historical resilence of 50-50 share in sharecropping contracts. The last chapter briefly catalogues the authors' impression about the future of the village and also some implications for policies.

Although the book should stand out as an important contribution to development economics, the reviewer cannot help mention two omissions except for which the book would have been more useful to an even wider audience. First, though the authors have expounded the received theories somewhat at length in the book, it would have appealed more to the theoreticians if the authors had infused more theoretical discussion. The profession would have greatly benefitted if they had utilized their considerable talents at theorizing in demystifying some of the theoretical puzzels that seem to abound in agrarian economies. It may be noted in passing that the authors did not even include their much celebrated exploration of the theory of efficiency wage, which emerged out of their sojourn of Palanpur, in this book. The exclusion of it, though may attest to the intellectual modesty of the authors, has deprived the readers the opportunity to find in one place the explanation of the jigsaw puzzle that seems to characterize the rural labour market. Secondly the question of policy issues has almost totally been evaded by the author (except for some ambivalent, apologetic remarks in the last chapter). While it has been in the best tradition of theoretical economics to leave the thorny issues of practical policy to 'men in authority' incorporation of such policy issues would have considerably improved the usefulness of the present book to planners and practitioners who have to grope in the darkness for policy guidance. Notwithstanding the above criticisms, I would consider it a major contribution to development economics and would recommend to anyone interested in the discipline.

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Articles

Note

Simulation of an Econometric Model to Analyze the Impact of a Buffer Stock Scheme in the Bangladesh Jute Sector

by

SULTAN HAFEEZ RAHMAN*

This paper is an investigation of the effects of a buffer stocks-supported price stabilization scheme on the Bangladesh jute sector. An econometric model of the Bangladesh jute sector is used for controlled policy experiments. A first order stochastic process is used to generate empirical probability distributions of the endogenous variables. A complete price stabilization policy, in which farm price is contained within a 7.5% band around the expected price is simulated. It is found that a substantial reduction in price instability can be achieved. While the estimated cost of the scheme is reasonable, the 95% confidence intervals are very large. The results of the simulations are also found to be highly sensitive to the assumed value of the export price elasticity.

I. INTRODUCTION

The issue of international commodity market stabilization has been mooted for several decades. In the wake of serious deterioration of the economic conditions of many Third World countries which depend critically on commodity exports, market stabilization has been placed high on the agenda of East-West dialogues. The inclusion of raw jute and jute products in UNCTAD's Integrated Programme for Commodities (IPC) as one of its ten 'core' commodities, reflects the international

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concern about jute.[1] Bangladesh and Nepal depend on jute for nearly 70% of their foreign exchange earnings. Over forty million farmers spread across Bangladesh, Nepal Burma, India and Thailand are critically dependent on jute and its allied fibre for their incomes.

Historically, jute prices and earnings have shown a great degree of volatility. Relative dispersion of actual jute prices and earnings are 27% and 25% respectively, for the period 1955/6-1976/7. Another dimension of the jute problem is the systematic decline in its real purchasing power. Atkinson and Murray [2] estimates reveal an average decline of 45% in prices and 57% in real earnings in the period 1961-75. A significant cause of the decline in jute demand is the competition from synthetic fibres in all end-use markets.

The LDC's concern is two-fold. First, excessive price instability harms low-income producers and creates socially costly discontinuities in resource planning and use at home and a loss of consumer confidence abroad. Price instability *per se*, may not be economically penalizing and wasteful but the concern is related directly to unexpected, large and frequent price swings. Second, the long-term decline in real purchasing power of commodity exports of the Third World is viewed as an outflow of resources.

Years of deliberations on the instruments to be used in the stabilization of world commodity markets have produced very little by way of substance. The instrument for price stabilization within the IPC framework was an international buffer-stock for raw jute to be financed from a common pool of resources, i.e., the Common Fund (Bhagwati [3]). The Common Fund idea became a lame duck quite early in North-South negotiations. The idea of buffer stocks for individual commodities hardest hit by market instability has also faced tremendous resistance, particularly from the North. For example, the recently concluded Jute Agreement in the International Jute Organisation forum does not envisage a jute buffer stock. Notwithstanding the outcome of international talks on jute thus far, this study examines as its main objective, the economic and financial effects of implementing a price stabilization policy supported by raw jute buffer stocks within Bangladesh. Before any price policy initiative in the jute sector can be investigated, it is essential to understand the price formation process. The development of a jute sector model for Bangladesh is, therefore, another objective of this study. The basic jute model, however, has been kept general enough so that it may be used to investigate other policy issues.

[1] The UN General Assembly called for a re-structuring of the world economy, through the establishment of a 'New International Economic Order (NIEO)', in 1974. The 'Integrated Programme for Commodities', is a major instrument for establishing the NIEO. See UNCTAD [20] for a detailed account of the IPC.

The focus of this study is on Bangladesh, a major raw jute producer and the leading exporter.[2] Since conditions in the world jute market are largely determined by the happenings in the Bangladesh jute market, the policy simulations in this study may be viewed as attempts to stabilize the world jute market.

Given the objective of this study, the approach taken is empirical. The theoretical work in the field has focussed almost exclusively on the question of distributional consequences of the welfare gains from price stabilization. The analytical work has shown that these consequences depend on the empirical characteristics of the market under investigation, e.g., non-linearities in demand, the source of instability, the nature of stochastic disturbances, the extent of risk-response, etc.[3] The analytical method used is comparative static. When more than one of these characteristics are present or when other factors are allowed to change, it becomes difficult to determine the welfare effects, *a priori.* An empirical investigation is, therefore, required to examine the economic and financial effects of a buffer-stocks scheme in the particular conditions of Bangladesh.

Section II, briefly states the major issues relevant to jute market modelling. An econometric model is presented, its salient features are discussed and the model is validated in Section III. In Section, IV, the basic econometric model is extended to develop a buffer stocks policy simulation model, by defining storage accumulation-decumulation rules and devising rules for the computation of financial costs, producer revenues and export earnings. Critical assumptions for the simulation runs and the modelling of random weather perturbations are also discussed in this section. The results of buffer stocks policy simulations are first discussed in detail and then summarized, in Section V. The study ends with some conclusions and policy implications, in Section VI.

II. SOME IMPORTANT ISSUES IN JUTE MODELLING AND THE RELEVANCE OF THE MODEL

The single most important issue in the economics of jute is price instability. There are two operating cycles in the jute economy, i.e., the level of economic activity in the industrialized countries and the weather cycle causing random supply shifts. However, it is generally agreed that price instability is largely caused by weather induced supply shifts. The argument is appealing since price fluctuations in the jute market are of a short-run nature. Acreage and yield are modeled separately because the latter was not found to be price-responsive. Since weather shifts show up in yields (productivity), random shocks can be applied to the yield equation

2The jute model used in this study is a country segment of a world model developed in Rahman [16].

3See Massell [11], Turnovsky [19], Just, *et al.*, [9] for a theoretical treatment of these issues.

to simulate the effects of weather. On the demand side, the level of economic activity (reflected in the index of world trade) appears as a shifter. This seems quite appropriate since business cycles do not manifest themselves randomly and independently. Thus, the jute model presented in Table I below takes account of the two major cycles in the jute market and separates out their effects.

The competition between *aus* rice and jute is another major issue in the economics of jute. The competition between these two crops is reflected in the model, in the jute-*aus* rice price-difference variable and the relative yield (jute-to-rice) variable in the acreage response function.

Risk associated with price and yield are likely to be extremely important elements in the economic calculations of the petty jute farmer.[4] Apart from its general importance, the inclusion of risk on the supply side is of critical importance. Just [9] has shown that 'risk neutrality' underestimates producers' welfare gains from price stabilization. This happens because the effect of risk on acreage decisions is ignored. Not much work has been done on the effects of 'risk neutrality' assumptions on the demand side. Price risk is likely to be particularly important in private storage decisions. At any price, private storage is likely to be higher if the expected price variance is high, compared to the converse situation. Thus, with price stabilization the public stocks authorities would have to carry the additional burden of stocks liquidated by the private trade. The crucial element of private-public storage interaction cannot be modeled without the inclusion of price risk. A simple theoretical treatment of the implications of including risk in a model used to analyse public stocks policies is contained in Appendix A.

The competition of Bangladeshi jute with synthetics on the one hand and with Indian jute (in the jute goods market) on the other, is yet another important issue. Unfortunately, both these effects, had to be included in proxy form. The difficulty in obtaining data on the prices of synthetics for a sufficiently long period of time, resulted in the use of the average of the wholesale price indices of major jute consuming countries, as a proxy for a price index of competing synthetics. The jute goods export volume was used as a proxy for the world price of jute goods.

III. AN ECONOMETRIC MODEL OF THE BANGLADESH RAW JUTE SECTOR

An econometric model of the Bangladesh raw jute market is presented in Table I.[5] It is a dynamic price determination model. A price cobweb and lagged

[4]Attempts to capture the effects of yield risk on acreage supply did not prove successful.

[5] See Chapters 3 and 6 of Rahman [16] for a detailed discussion of the issues relevant to modelling the jute sector and presentation of the model. See Chapters 4, 5 and 6 for a complete discussion of methodological issues in parameter estimation, and validation of the model.

relative yields on the supply side, and autoregressive price risk variables on the supply and demand sides are the dynamic elements of the model. The model is complete, since it depicts the flow of raw jute from its origin (production) to the various end-uses, viz., mill consumption, export and storage. A set of eight algebraic relationships characterize the jute model. Of these, five are behavioural relationship and three are closure rules. Definitions of symbols used to represent variables throughout the text, follow Table I.

Acreage, yield and production comprise the supply bloc of the model, while mill demand, export and storage comprise the demand bloc. Relations (4)-(8) comprise a completely simultaneous system. Since the supply bloc is recursive with

TABLE I

AN ECONOMETRIC MODEL OF THE BANGLADESH JUTE SECTOR

$$A_t = \underset{(3.23)}{31.49^*} + \underset{(0.009)}{0.03^*D_{t-1}} - \underset{(1.81)}{4.60^*YJR_{t-1}} \; \underset{(0.02)}{0.08^*SPG_t} - \underset{(1.42)}{4.68^*DA} - \underset{(1.38)}{4.08^*DB} + e_{1t} \quad \ldots(1)$$

$$\bar{R}^2 = 0.77, \quad DW = 2.46$$

$$Y_t = 4.63^* - 0.105^*{}_T + 0.002^*{}_T{}^2 + e_{2t} \quad \ldots(2)$$

$$R^2 = 0.73, \quad DW = 1.86$$

$$Q_t = A_t^* Y_t \quad \ldots(3)$$

$$MCR_t = \underset{(5.81)}{26.04^*} - \underset{(0.007)}{0.026^*PRG_t} - \underset{(0.006)}{0.02^*XI_t} + \underset{(0.14)}{0.07STI} + \underset{(0.08)}{0.79^*{}_t} - \underset{(1.83)}{10.08^*DC} + e_{3t} \quad \ldots(4)$$

$$\bar{R}^2 = 0.97, \quad DW = 2.9$$

$$XR_t = \underset{(4.30)}{66.48^*} - \underset{(11.70)}{71.94^*RPX} + \underset{(1.77)}{5.77^*RPM} - \underset{(0.08)}{0.49_t{}^*} - \underset{(2.58)}{17.1^*DC} + e_{4t} \quad \ldots(5)$$

$$R^2 = 0.93, \quad DW = 1.97$$

$$SR_t = \underset{(1.56)}{7.8^*} - \underset{(0.01)}{0.05^*PRG_t} + \underset{(0.05)}{0.11^{**}SPG_t} + \underset{(0.11)}{0.28^*{}_t} + \underset{(2.76)}{16.7^*DD} + e_{5t} \quad \ldots(6)$$

$$\bar{R}^2 = 0.86, \quad DW = 1.87$$

$$PRG = F.PRX - M \quad \ldots(7)$$

$$SR_{t-1} + Q_t = MCR_t + XR_t + SR_t + VCR_tER_t \quad \ldots(8)$$

Notes : (1) Figures in parentheses are standard errors.

(2) *denotes significance at the 1% error probability level.

(3) **denotes significance at the 5% error probability level.

DEFINITION OF VARIABLES USED IN THE JUTE MODEL

A : Acreage of raw jute.

Y : Yield of raw jute.

Q : Production.

MCR : Mill consumption of raw jute.

XR : Exports of raw jute.

SR : Storage of raw jute (closing stocks).

PRG : Price of raw jute (grower's).

PRX : Price of raw jute (f. o. b. Bangladesh ports).

PRB : Raw jute export price in taka.

M : PRB—PRG.

F : Exchange rate (official).

ER : Accounting errors reported by the Jute Ministry.

VCR : Farm retention of jute for seed and other uses.

t : Time index.

DPL : Lagged price difference (Jute-and-rice).

YJR : Lagged Yield ratio (jute-to-rice).

SPG : Price risk (jute).

XI : Indian jute goods export volume.

WTI : Index of World Trade.

WP : Wholesale price index of major consumers.

RPX : PRX/WP

RPM : PM/WP

DA : Dummy variable reflecting change in acreage estimation methods.

DB : Dummy variable reflecting direct government control over raw jute trade.

DC : Dummy variable reflecting political change following the 1971 civil war.

BCO : Buffer carryout (year-end) stocks.

BCI : Buffer Carry-in (beginning-year) stocks.

P_u : Upper limit of control price band.

P_l : Lower limit of control price band.

PURCH : Buffer purchases.

SALE : Buffer sales.

s : Unit storage cost.

r : Rate of interest.

respect to the simultaneous sub-system (i.e., rest of the relationships taken as a whole), the jute model is bloc-recursive in structure and, therefore, can be solved more easily. The first identity (3), states that production is the product of acreage and yield. The second identity (7), specifies the relationship between the world price (export price, f.o.b. Bangladesh ports, expressed in U.S. dollars) and the growers' price. The last identity is a closure rule for the model constraining demand to match existing supply in a given year.

All behavioural equations were estimated from annual time series data covering the period 1955/6-1976/7. The simultaneous demand bloc equations were estimated using the two stage least squares method. All estimated parameters except the index of world trade are highly significant (5% or more). Though the index of world trade is not statistically significant, it has been retained because of the appropriate sign and theoretical importance of the variable in the model. A geometric presentation of the model is given in Figure 1.

The acreage supply function differs significantly from the more familiar estimates. The price effect is captured by a price difference (jute price minus rice price) variable lagged one period. The estimated coefficient on the price difference variable yields a percentage acreage supply response of 0.3. Since annual time series data have been used this supply price response estimate is a short-run one. The sign of the lagged relative yield (jute-to-*aus* rice) variable is not perverse, as expectation might suggest. To the contrary, the negative sign is revealing. That an increase in the yield of jute relative to *aus* rice lowers jute acreage, may be explained by appealing to the realities of subsistence in a poor, fragmented agricultural

A DYNAMIC PRICE DETERMINATION MODEL OF THE RAW JUTE SECTOR

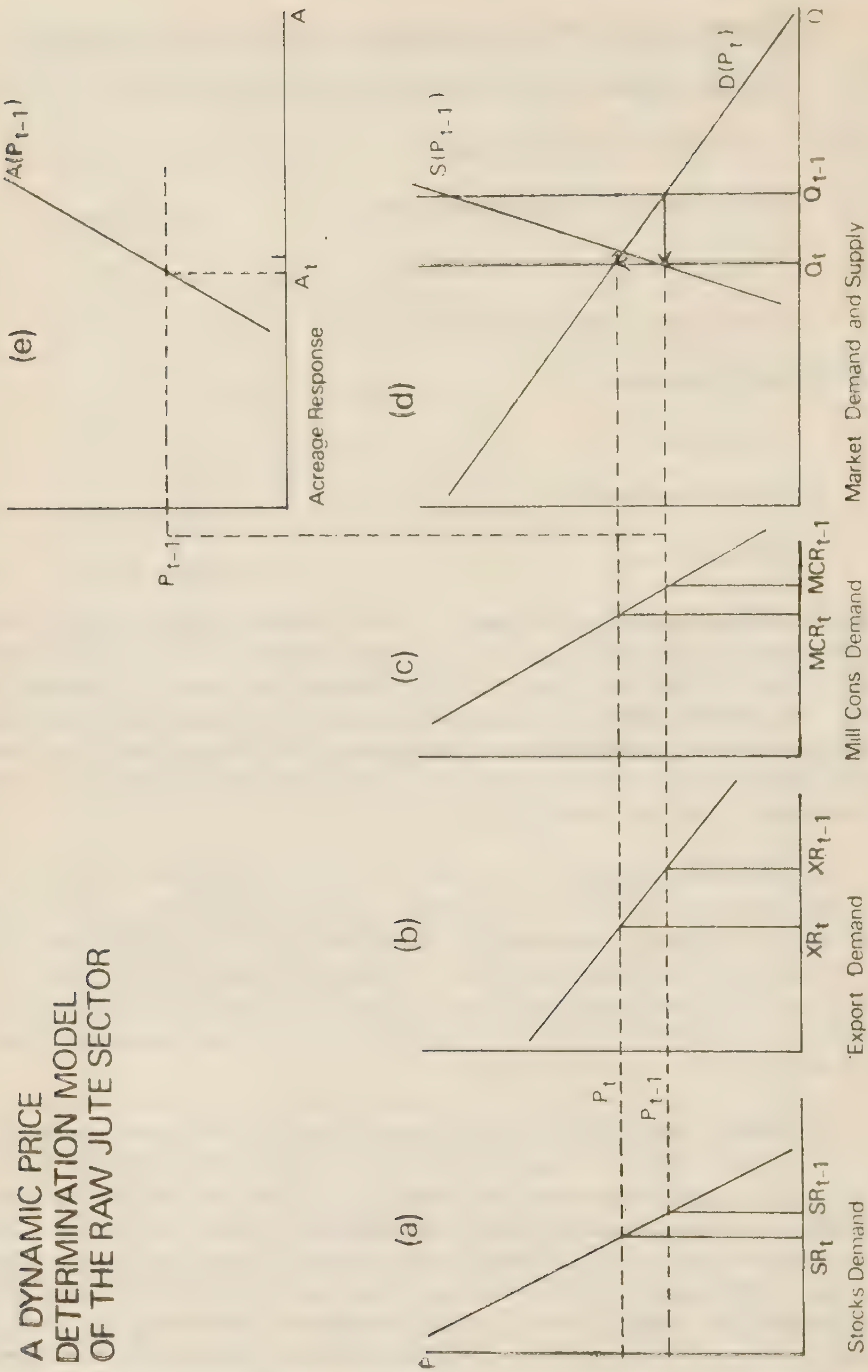

Figure 1

economy like Bangladesh. If jute yield increases in relation to rice, at least the same amount of jute can be obtained from a smaller acreage, thus releasing additional land for rice cropping to meet (growing) subsistence requirements of the household.

The price risk variable (SPG) is a moving standard deviation of the past seven years' jute prices. The negative sign of this variable reflects risk aversion of jute suppliers. The two dummy variables represent the change in acreage estimation methods and a structural shift due to public policies on raw jute trade, respectively. There is considerable agreement regarding the inaccuracy of jute yield data in Bangladesh. The yield function estimated here, turned out to be a curvefitting exercise, since plausible yield models could not be meaningfully estimated. The second-degree polynomial fit was suggested by a plot of the yield data over time.

Inclusion of an index of world trade as the relevant income variable in the mill consumption (input demand) function, allows the model to capture the indirect effects of world business cycles on raw jute consumption in Bangladesh (through its impact on manufactured jute exports). The deliberate policy on the part of the government to boost exports of jute goods is conveniently captured by a time trend. A dummy variable (DC) is used to represent the structural change in the jute market following the emergence of Bangladesh in 1971. Strictly, the output (jute goods) price should appear as an explanatory variable in the input demand function. Experiments to include the output price variable in several forms proved abortive. The reason seems to lie in the existence of the export bonus scheme, which in all likelihood, obscured the relationship between mill consumption of raw jute (i.e., production of jute goods) and the price of jute goods. Attempts were made to include the Indian price of jute goods (also the world price) as the relevant price variables. Since this did not provide meaningful results either, the volume of Indian jute goods exports was used as the relevant proxy varibable.[6] The price elasticity of input demand suggested by the estimated mill consumption function is 0.24 (at the means of price and consumption).

The price elasticity of export demand at—0.96 is not significantly different from one.[7] This is an extremely important finding, given the strong implications of this parameter for public policies. Till now, the price elasticity of raw jute export demand was almost universally estimated to be significantly below one. It may be recalled that apart from specification, the major difference between this and other studie is that export demand behaviour in this case has been estimated using a simultaneous equation method as opposed to single equation methods used in other studies.

Raw jute stocks have played a highly significant role in absorbing the economic shocks concomitant with highly unstable supplies. Except for the first five years

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6The procedure is similar in principle to an instrumental variable method.

7A test of significant difference was performed to ascertain this.

following the independence of Bangladesh, a very large proportion (over 80% of raw jute stocks) were held by the private trade. Storage demand in the jute model is, therefore, specified as a private storage demand equation. The same price risk variable used in the acreage supply function, has been used in the storage demand function. The positive sign of the price risk variable in a private storage demand function is to be expected, since stockists trade on price fluctuations.

The world-domestic jute price difference (M), reflects a jute cess and an export duty (in some years) besides reflecting transportation cost and a marketing margin. The price difference, M, was found to be invariant with changes in the level of exports, and is therefore, treated as exogenous to the model. Farm retention of jute for seeds and other uses also remained fairly constant, and is also assumed to be exogenous.

This model, however, differs from the familiar models of Waugh (1944), Oi (1961, 1963, 1973) and Massell (1969) and the more recent models used to analyse public stocks schemes,[8] in some significant ways. First, the uncertainty of supplies is a multiplicative stochastic disturbance term, since weather shifts have been captured by including an additive stochastic error term in the yield equation (discussed in detail later). Secondly, private storage demand is explicitly included in the model. Thirdly, the influence of price risk on producers and the private trade has been included. It was mentioned earlier that the distributional conclusions of welfare analysis of public stocks schemes are highly sensitive to the inclusion of both private behaviour and risk response. Finally, there is no explicit price equation in the model. Price behaviour appears implicitly in the market clearing identity (8) as a reduced form.

Though the model presented in Table I addresses the major issues relevant to the jute market, it must be viewed as a stylized version of the actual price formation process in the Bangladesh jute market. It is always difficult and often impossible, to model the complexity and intricacies of a real economic process. Even in the natural sciences, where controlled experimentation is possible, the striving is towards simplification and abstraction. For abstraction alone allows generalizations without which it is not possible to understand the laws that govern the existence and development of phenomena. While simplicity can never replace real phenomena, it can conveniently reveal the essential attributes of the relevant process. This is the best one can hope for. There is a trade-off between abstraction and representation of the real process itself. The solution to this constrained optimization problem depends on the objective function (an important element of which is individual "bias" and preference) of the researcher.

8See for instance, Sharples, *et al.* [17], Zwart and Meilke [13] Ford [6] and Epps [5], Labys [10].

Validation of the Model

Turning to performance and validation of the model, it is apt to remember that in the absence of a theoretical basis for discriminating between validation methods, several parametric and non-parametric tests of model validation are normally used.[9] Commonly used parametric validation measures include the root mean squared percentage error (RMSPE), the Theil [18] inequality coefficient (U) and the coefficient of determination (R^2). Strictly, U is a more appropriate measure when the variables of a model appear as first differences.[10] The jute model was solved annually over the entire sample period. The three parametric validation measures, R^2, RMSPE and U, were estimated using the solved and actual values of each of the endogenous variables. These measures are given in Table II. The most common type of non-parametric validation is the graphic matching of simulated values of endogenous variables against their historical behaviour. This test subjectively measures the efficiency of the model in predicting the levels of variables and their turning points. This test was performed for each of the endogenous variables, but is not given here for reasons of brevity.[11]

The RMSPE being a percentage measure can also be compared across variables. Forecast error for raw jute storage at 31.5 % is the highest, while the lowest forecast error is for mill consumption of raw jute. Though the R^2 for jute storage and acreage are similar, the RMSPE for acreage at 11.3 % is significantly lower than the RMSPE for storage behaviour. This is because forecast error contains both bias and/or inefficiency and, RMSPE weighs these two sources of forecast error. The conflict between available data on stocks and the specification of the storage equation may well explain the large forecast errors. Even though storage demand behaviour was postulated to approximate the behaviour of the private traders, large public stocks, particularly during the 1970-75 period were held. In general, however the results of model validation are good. These results demonstrate the model's ability to explain the historical

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9See for example, Howrey [8] and Jorgenson, *et al.* (1970) for parametric tests and Naylor, *et al.*, [14 [Fromm and Taubman [7] and Dhrymes [4] for non-parametric tests.

10This can be seen from the definition of U, which is as follows

$$U = \sqrt{[\Sigma\{(Y_t^* - Y^*_{t-1}) - (Y_t - Y_{t-1})\}]^2 / \Sigma(Y_t - Y_{t-1})^2}$$

where, Y denotes any variable and the asterisk denotes predicted values. The coefficient U, therefore, compares the root mean squared prediction error with the prediction error of forecasts of no change. Its theoretical limits range from zero to infinity. When U=0, predictions of the model are only as good as naive (no change over the previous period). As $U => \infty$, predictions become increasingly worse compared to the naive hypothesis. However, U has the advantage of being compared across variables (being a pure number) and it can be decomposed into three sources of prediction error.

11These tests appear in Figures 9 through 16, pp. 120-27 of Rahman [16].

behaviour of all the endogenous variables. It must be remembered that perfect forecasts are never possible, if only due to sampling variation.

TABLE II

VALIDATION STATISTICS FOR THE ESTIMATED MODEL

Variables	R^2	RMSPE	U
Acreage	0.85	0.113	0.055
Yield	0.87	0.085	0.042
Production	0.63	0.142	0.070
Mill Consumption	0.96	0.099	0.047
Export	0.89	0.143	0.068
Storage	0.86	0.315	0.137
Export Price	0.70	0.151	0.075
Farm Price	0.92	0.215	0.092

Notes : i) R^2 from regression of predicted on actual values of each endogenous variable.

ii) RMSPE is the RMSE adjusted for the mean in each case and hence, expressed as a percentage.

iii) U is the Theil inequality co-efficient.

IV. SIMULATION OF BUFFER STOCKS POLICIES

The central task of this study, i.e., the analysis of simulated buffer stocks supported price stabilization policies, will be addressed in this section. Since, international concern is focussed on the stabilization of the raw jute market, only this market is considered here.

The Simulation Model

The econometric model presented in Table I, forms the basis of the jute buffer stocks simulation model, to be used in this section. The econometric model given in Table I is converted to a buffer stocks simulation model by extending it to include

storage rules and compute financial costs of buffer operations. The complete simulation model is given in Table III. These storage rules, adhered to by a hypothetical jute agency, specify the amount of purchases/sales to be made, given each year's supply, demand and a pre-determined price band within which the agency attempts to contain price. Thus, public stocks activity under consideration here, is based on price reaction.

The rules for computation of financial costs are given in the simulation model (Table II). Financial costs and total export revenues are critical elements of the buffer stocks policy simulations undertaken and hence require elucidation. The buffer agency incurs an initial expenditure to purchase a specified beginning level of stocks. It is assumed that these purchases take place at the market price. VCB is thus, the initial variable cost. It the buffer agency holds no stocks initially, VCB is also the initial debt. Annual variable cost is the sum of net sales plus VCB. The mean level of public stocks is determined by averaging the beginning and end-year stocks levels. Unit storage cost is applied to the average level of stocks to yield

TABLE III

A JUTE BUFFER STOCKS SIMULATION MODEL FOR BANGLADESH

Economic Sub-model

$A_t = 31.49 + 0.03DP_t - 4.60\ YJR_t - 0.08SPG_t - 4.08\ DB$

$Y_t = 4.63 - 0.105_t + 0.002_t^2 + e_t$

$Q_t = A_t * Y_t$

$MCR_t = 26.04 - 0.026PRG_t - 0.02XI_t + 0.07WTI + 0.79t - 10.08DC$

$XR_t = 66.48 - 71.94RPX + 5.77RPM - 0.49t - 17.1DC$

$SR_t = 7.8 - 0.05PRG_t + 0.11SPG_t + 0.28_t + 16.7DB$

$PRG = F.\ (PRX - M)$

$SR_{t-1} + Q_t = MCR_t + SR_t + VCR_t + ER_t$

Buffer Stocks Rules Sub-model

Either, $BCO_t = BCI_{t-1} - [Q_t - Q\ (P_u)]$

or, $BCO_t = BCI_{t-1} + [Q_t - Q\ (P_1)]$

or, $BCO_t = O,\ [Q_t < Q\ (P_u)]$

or, $BCO_t = Max\ BCO_t$

or, $BCO_t = BCI_{t-1}$

(Contd.)

Financial Sub-model

$VCB = P_l \, . \, BCI$

$VP = VCB/BCI$

$VCE = VCB + P_l \, . \, PURCH - VP. \, SALE$

$COST = \, . \, \frac{1}{2} \, (BCI + BCO)$

$LCOST = \frac{1}{2} \, (VCB + VCE). \, r$

$BSICOST = SCOST + ICOST$

$BNC = BSICOST + P_l \, . \; PURCH - P_u \, . \; SALE$

Notes : i. A flow chart representing this model was prepared to develop the computer programme. It is given on p. 148 Rahman [16].

ii. The complete sequence of storage rules is enumerated on p. 139 of Rahman [16].

storage costs. Similarly, interest cost is computed by applying the rate of interest to the average variable cost, given by the interpolation of the beginning and end-year variable costs. Net operating costs of the buffer stocks scheme (BNC) is the sum of net sales and, buffer storage and interest cost. It is also important to know if the buffer agency could cover its operational costs, should the scheme be terminated, i.e., stocks are liquidated at any time. The potential net cost (PNC), defined as the difference between buffer net cost and the market value of existing stocks provides this information.

Simulated Policies

The stabilization scheme simulated here, is one of complete price stabilization (CS). Under this policy, the buffer authorities attempt to restrict price fluctuations to within $\pm 7.5\%$ of the long-run equilibrium price, which is defined as the trend price.[12] Two simulations of CS, referred to as CS1 and CS2 are conducted. In CS2, operating constraint on the size of buffer stocks are imposed. The control case, which forms the basis for comparison, is given by the simulation of a 'free market' (FM). Here, the world 'free market', simply implies the absence of any kind of buffer stocks policies. It is merely a 'business-as-usual' scenario. Thus, three scenarios viz., FM, CS1 and CS2 are simulated and the results investigated.

[12]This policy must not be misunderstood as price augmenting since there is no trend even in the nominal prices. A trend equation is fitted to the price forecasts from a deterministic solution of the basic econometric model. The estimated trend equation for the period 1970-77, is, $PRG = 33.02 + 0.175t$, where the co-efficient of time (t) is not significantly different from zero, even at the 20% level.

In all policy simulations, a price band of $\pm$ 7.5 % is used. This range is moderate (as against $\pm$ 5 % : too narrow ; or, $\pm$ 10 % : too wide). It has been shown that a trigger price band of $\pm$ 7.5 %, would be required to cover carrying charges, associated with public stocks [UNCTAD, 21]. The price band, which operates as a trigger for buffer activity, must be just sufficiently wide to allow optimal buffer action. A price band that is too wide will be inoperative due to lack of activity, whereas a price band that is too narrow will be overburdened with activity.

Computer simulation enables the creation of a psuedo-real market in which buffer sales and purchases are made whenever market price falls outside the pre-determined price band. Thus, a price stabilization policy is put into effect in the Bangladesh jute market under controlled conditions.[13]

Assumptions about Storage Cost, Interest Rate and Jute Goods Export

It is extremely difficult to obtain reliable estimates of unit storage costs (including moving in and out cost). The UNCTAD [21] estimate of 3.9 % of the per ton price translates to $ 10.8/ton. This is less than half the estimate used by Labys [10]. His estimate is $ 25/ton plus $ 4/ton for moving costs. Two storage cost estimates defined as low and high were used in this study. The low estimate is the same as the UNCTAD estimate of $ 10.8/ton. The second or high estimate, is simply two times the low estimate, i.e., $ 21.6/ton.

The rate of interest is assumed to be 7 %. Given that the risk of buffer operations will fall disproportionately on producing countries, 7 % rate of interest is a high figure. The IMF buffer stocks facility offers short and medium term loans at interest rates of 4.5 % to 6.5 %. The actual rate of interest in any commodity agreement is unlikely to exceed the IMF rates. At 7 %, the assumed rate of interest is on the higher side.

Instead of using an estimated jute goods export demand function, the calculation of total export revenue uses both results internal to the simulation and a knowledge of exogenous relationships within the jute sector, particularly as pertains to the export of manufactured jute products. As is well-known, a very high proportion (over 85 % in the period 1970-77) of manufactured jute goods is exported abroad. This proportion was found to be quite stable in the simulation period. The process of transformation of raw jute into manufactured jute involves a 5 % wastage factor. This wastage factor and the relatively stable jute goods export proportion was used to compute jute goods exports, given endogenously determined mill consumption of raw jute. The exogenous jute goods price was applied to the

13The basic computer programme developed by Sharples and Holland (1978) was used here, after appropriate modifications.

jute goods export to obtain the value of jute goods exports, which in turn was added to the endogenous raw jute export revenue to yield total export revenue. Getting around the estimation of a separate jute goods export demand equation provides greater econometric and mathematical convenience, without any major loss of realism.

Simulating the Effects of Weather

The task of appropriately simulating the effects of weather-related fluctuations on the jute market is operationally quite difficult. As noted earlier, large shifts occur in jute supply due to random weather perturbations. The effects of weather shifts show up in yields. It was, therefore, decided to include an additive error term in the yield equation of the jute model (Table III). Though, the error component enters the yield equation additively, it enters the production or supply equation multiplicatively. This is very important to remember, since the debate on welfare implications of price stabilization shows the results of price stabilization policies to rest critically on this point. All simulations of the basic model are, therefore, stochastic. The standard error of the estimated yield equation was specified (with zero mean) to allow the computer subroutine to generate psuedo-random numbers and transform them to appropriate error terms in the yield equation. This method of generating a random distribution is different from McCarthy's [12] often used stochastic simulation algorithm, in which observed residuals from the regression equation are used to impart stochastic shocks to a given system.

Stochastic simulation of this type provides an entire distribution of short-run supply functions, and consequently a price distribution, i.e., supply shifts randomly along a stable demand function.[14]

The Simulation Time Horizon and Size of the Psuedo-real Sample

As discussed earlier, the econometric model (Table I) was estimated using annual time series data for the period 1955/6—1976/7, i.e., 22 years. Since stochastic simulation can generate very large samples, a short time span provides sufficient information regarding the behaviour of the system under study. It is unnecessary,

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14 In general terms,

$$P = \frac{1}{K}(\alpha + \beta X + e),$$

where P is the reduced from solution for price, k is the sum of demand and supply price elasticities, α is a vector of scale parameters, β is a matrix of estimated coefficients of the exogenous variables of the model, X is a vector of exogenous variables, and e is vector of stochastic errors. Originating from the supply side, e, defines an entire distribution of prices, P.

therefore, to consider the entire 22-years sample for policy analysis, and in the present case there are good reasons for limiting the sample. Conditions in the world jute market have changed dramaticlaly following the emergence of Bangladesh in 1971. The post civil war (1971) market situation represents an irreversible change. To reflect the changed circumstances of the jute market, the time horizon for all policy simulations was chosen to be 1970/1—1976/7. The results of all policy simulations show the effects of a complete price stabilization policy, had these been effective in the seven year period, 1970/1—1976/7. However, since jute outlook is expected to remain mostly unchanged in the near future, the results also provide a reasonable approximation of the effects of the simulated policies, at least in the same future time horizon.

It has already been noted that stochastic simulations can generate very larg samples. For the purpose of buffer stocks policy analysis, below, a set of three depending on the scenario under investigation.[15] Since the model is solved over seven years, the total sample size (consisting of psuedo-real observations) is boosted to either 2100 or 700 years as the case may be. Analysis of the massive output generated by stochastic simulation is a science in itself (Naylor, [15]). The results reported here are selected from the stochastic simulations. To make presentation succinct and yet meaningful, only expected values and in some cases second moments of the distributions of some important indicator variables are given. However, the empirical probability distribution of jute prices and financial costs have been shown.

V. RESULTS OF A SIMULATED PRICE STABILIZATION POLICY

Table IV summarizes the solutions of major indicator variables in the three sets of simulations. The third set of policy simulations (CS2) differs from the second (CS1) in terms of the level of stocks held by the public storage agency, at the time of commencement of the scheme, and the existence of an upper bound on the amount of buffer stocks that the agency can carry. Such a constraint could be justified quite easily on grounds of credit availability or space but will compromise the objective of price stabilization. The market demand elasticity is —0.8 for all simulations.[16] The results in Table IV, are presented in terms of the expected values and in some cases, both expected values and relative dispersions. Relative dispersion is considered as a measure of instability in each case.

15 Increasing the set of random numbers beyond thirty, makes little difference to the results, which tend to stabilize after 30 iterations. This is an important reminder in terms of saving computer costs.

16 This aggregate market demand elasticity is simply a weighted sum of individual demand elasticities, the weights being respective market shares. The three individual demand elasticities are : mill consumption, —0.34 ; export demand, —1.29 ; and storage demand, —0.82 computed at the means of price and quantities.

TABLE IV

IMPACT OF PRICE STABILIZATION POLICIES ON MAJOR INDICATOR VARIABLES IN THE JUTE SECTOR

Variables	Free Market	Complete Price Stabilization Scenarios	
		CS1	CS2
Harvested Acres (mil. acres)	1.80	1.85	1.82
Production (000 tons)	928.0	952.7	940.5
Mill Demand (000 tons)	455.7	455.7	457.5
Export Demand (000 tons)	385.4	385.3	395.2
Storage Demand (000 tons)	364.4	360.0	361.8
Export Price ($/ton)	280.4 (0.22)	279.3 (0.10)	275.1 (0.16)
Farm Price ($/ton)	205.3 (0.21)	204.2 (0.12)	200.0 (0.16)
Producer Revenue (mil. $)	190.5 (0.24)	194.5 (0.21)	188.1 (0.21)
Export Revenue (mil. $)	108.1 (0.13)	107.3 (0.15)	108.7 (0.14)
Total Export Revenue (mil. $)	270.2 (0.17)	270.5 (0.20)	271.6 (0.19)

Notes : i. Figures in parentheses are relative dispersions.

ii. Total export revenue=export revenue from raw jute plus jute goods.

iii. In CS1 there is no initial buffer stocks and no limit on the carryout level. CS2 allows for a 139,000 tons carryin stocks and a 179,000 stocks constraint on carryout.

Table IV shows quite clearly that a substantial reduction in price instability is possible, by pursuing a policy of complete price stabilization. Producer revenue increases by $ 4 million but, it is not stabilized significantly. The level of expected export earning, while unchanged, is destabilized somewhat, reflecting a greater than unitary export demand elasticity. Production of raw jute registers a marked

increase. Part of this increase is due to producer's response to lower price risk as a result of price stabilization. The increase in production more than offsets the decrease in price, thus raising the level of producer revenue. The income of private stock holders declines, since both private storage and price decline, again reflecting risk response of private traders in the storage market. These results are in accord with the theoretical predictions contained in Appendix A.

The results of the third scenario, i.e., with two parametric variations on the agency's storage rules (stated earlier) are given in column (4) of Table IV. The expected jute price declines by over $ 4/ton. This is due to the price depressing effect of initial stocks at the disposal of the buffer agency. However, it must be understood that the availability of initial stocks and a ceiling on closing stocks, have opposite effects on the price level, and their net effect on the price level cannot be unambiguously predicted. Initial stocks tend to keep the market price from breaching the ceiling price (increased sales are made possible in earlier years) but, the constraint on closing stocks allow market price to fall below the specified floor price. The ultimate effect of these parametric changes on expected jute price, depends on the relative size of initial stocks and constraint on closing stocks. Instability of producer revenue remains unchanged, but its level declines sharply, due to decrease both in production and price. The drop in production is a combined effect of lower price and greater price variability, compared to the second scenario (CS1). Increases in mill consumption and export are induced by the fall in market price, while the increase in private stocks is induced both by the price decline and increased price risk.

Price instability, while higher in CS2 compared to CS1, is still 27% less than the free market i.e., the 'conditions as-they-are' case. Thus, price instability is greatly attenuated under either stabilization policy, without significantly destabilizing jute earings.[17] *It is important to recall here, that had a comparative-static exercise been conducted, significant deterioration in earnings instability would be observed, because export demand elasticity is above unity. The change in other market conditions has offset the basic comparative static result.*

Empirical probability distributions of short-run market prices of raw jute under the three different scenarios is given in Figure 2. The price distribution is approximately normal in the free market case.[18] However, there is a strong leptokurtic tendency in the price distribution generated under CS1, i.e., when no initial stocks are available to the storage agency and it is not constrained in its carryout

17In general, when exogenous demand shifters are allowed to change along with supply stocks, the comparative-static relationships between revenue and price elasticity may no longer hold. The degree of deviation of revenue from comparative-static solutions, depends on the magnitude of demand shifts.

18A Kolmogorov-Smirnoff test was used to reject the null hypothesis of non-normality.

levels. The manifest normality of the price distributions is expected, given the assumption of normally and independently distributed jute yields. The differences in price distributions generated by FM and CS1 are much more marked, since a 50% reduction in the variance takes place. The lower limit of the price distribution moves from \$ 106 under FM, to \$ 246 under CS1 and then down to \$ 125 under CS2. The upper limits for the sequence of policy scenarios is, \$ 470, \$ 420 and \$ 445, approximately, while the probability of price falling in the range \$ 246-302, is 37% under FM, it is 80%, under CS1 and 59% under CS2. Thus, even CS2 provides *substantial price stabilization.*

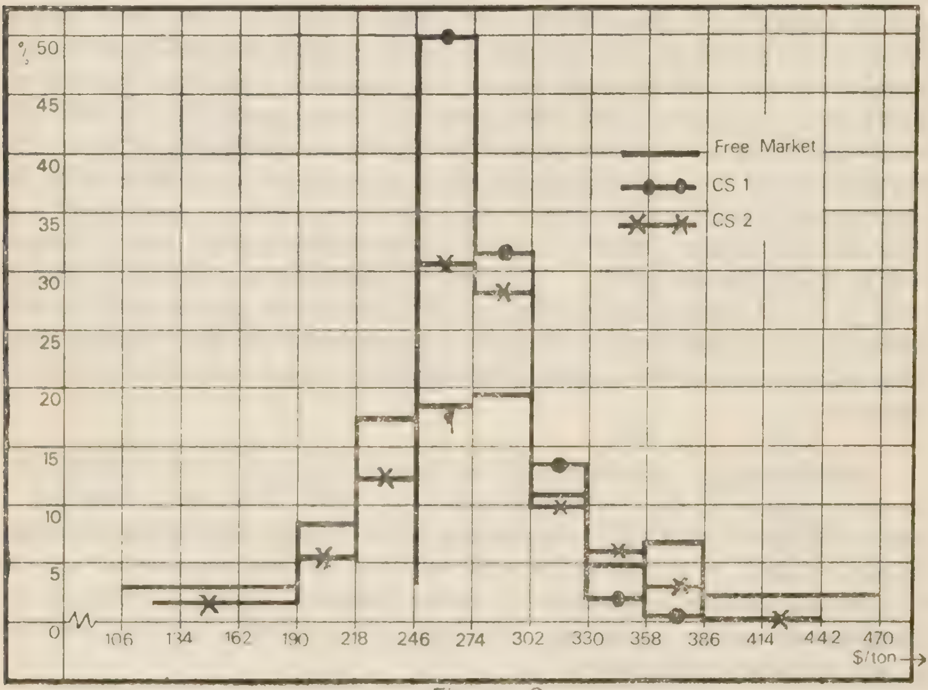

Figure 2

Table V, shows the probability distributions of buffer stocks for the simulation period under the two stabilization policy scenarios. Expected buffer stocks under CS1 are 210,000 tons with a standard deviation of almost equal magnitude (relative dispersion is 93%). Parametric variations on storage rules reduces the mean buffer carry out level to 117,000 tons with a standard deviation of 68,000 tons, i.e., the relative dispersion is 58%. The mean stocks size of 117,000 tons apparently seems large in view of the fact that a buffer stocks size of 175,000-210,000 tons for all producing countries has been suggested (UNCTAD). However, it does not seem large when cognizance is taken of the fact that Bangladesh as major producer

TABLE V

EMPIRICAL PROBABILITY DISTRIBUTION OF BUFFER STOCKS SIZE UNDER ALTERNATIVE PRICE STABILIZATION POLICIES

Interval (000 tons)	CS1 Probability	CS2 Probability
0.0	16.8	17.8
0-44	5.8	4.1
44-89	7.2	9.1
89-134	8.5	10.6
134-179	12.7	58.9
179-223	11.7	0.0
223-268	8.9	0.0
268	29.1	0.0
670	3.5	0.0
Mean	210.0	117.0
Standard Deviation	195.0	68.0

and the dominant exporter would have to bear the burden of world market stabilization.

The probability of buffer stocks being in the range 44-179 thousand tons is 28% under CS1 and 79% under CS2. In the latter policy scenario there is a 60% chance of the stocks size lying between 134-179 thousand tons. Under CS1, this probability is only 13%. There is a 50% probability of buffer stocks level exceeding 179,000 tons, and a 29% probability of its level exceeding 268,000 tons, when the stocks agency does not begin its activity with a certain level of stocks and is not restricted in its holding capacity. Apart from considerations of physical space, financial constraints would make such large stock holding extremely difficult.

Large dispersions of the buffer stocks distributions, make the confidence intervals around predicted expected value very large. This could impose potentially large financial obligations on the public agency. The results in this regard are perhaps a reminder of weakness of the simulation model. The second moments of the stocks distributions are large because of random shocks of large magnitudes. Large random (weather) shocks reflect unsatisfactory prediction of yield behaviour

in the jute model. In other words, the difficulty may be arising due to an over estimation of yield variability.

Table VI shows that there will be no buffer activity in 35% of the cases under CS1. It remains practically unchanged under CS2. There is a 15% differential between the percentage of buffer sales and purchase in case of CS1. The asymmetry is a direct reflection of the so-called 'unconstrained' conditions of this stabilization policy. The buffer agency will frequently be unable to defend the upper bound price, especially in the early years when there is a significant probability that it will have no stocks. Conversely, with no maximum limit on the size of buffer stocks the agency is always able to defend the floor price. On the one hand, prices rise above and on the other, they never fall below the floor. Thus, even with an approximately normal distribution of prices about the stabilization bands, the observed 'stabilized' prices will be asymmetric. The probability of purchases and sales in 35% and 32% under CS2. The amounts of purchases and sales is also similar at 31,000 tons and 32,000 tons. Under CS1, the agency is a net buyer. As expected, the constraint or buffer carry out causes market price to fall below the floor price even after the action. In case of CS2 there is a 41% chance of the market price breaching the pre-determined price band. The same probability is 64.5% for CS1. The probability of running out of stocks is not altered significantly under CS2.

TABLE VI

BUFFER STOCKS ACTIVITY UNDER ALTERNATIVE PRICE STABILIZATION SCENARIOS

	CS1	CS2
Stocks Purchases	40.5	34.9
Stocks Sales	25.0	31.1
No Action	34.8	34.0
Zero Stocks	16.8	15.8
Price $<P_l$ Before Action	40.5	38.9
Price $<P_l$ After Action	0.0	24.3
Price$>P_u$ Before Action	30.8	32.6
Price$>P_u$ After Action	14.9	16.9
Buffer Purchases (000 tons)	60.0	31.0
Buffer Sales (000 tons)	37.0	32.0

Estimates of net cost are provided in Table VII. The net cost of the buffer storage scheme under CS1, is $ 8.7 million (low cost estimate) or $ 10.7 million (high cost estimate). These estimates for CS2 are $ 1.9 million and $ 3.20 million. The dispersion around expected beuffer net costs is very large. The second moment, is several times larger in value than the mean in either case. The probability of profits (negative net cost) and losses (positive net cost) is 36 % and 64 % respectively, under CS1. The probability of loss under CS2, is considerably higher at 70 %. While the buffer agency is a net buyer under CS1, it is a net seller under CS2. Yet, the probability of loss is so high under CS2, because interest and storage charges more than offset the net revenue from market transactions. Table VIII shows that the probability of net costs being above $ 20 million is 31 % under CS1. This same probability is 12 % under CS2. The probability of incuring operating losses is 64% under CS1, and 70% under CS2. The negativity of potential net cost shows that the agency will be able to cover its costs of operation at the time of termination of the scheme. Indeed, the agency would be left with a surplus of $ 49 million if CS1 is liquidated at any time. The slavage value drops to $ 28 million under CS2.

TABLE VII

FINANCIAL COSTS OF BUFFER STOCKS OPERATIONS UNDER ALTERNATIVE PRICE STABILIZATION SCENARIOS

(million $)

	CS1	CS2
Low Cost Estimate		
Buffer Net Cost	8.7 (39.2)	1.9 (26.0)
Minimum Net Cost	-143.2	-55.0
Maximum Net Cost	134.2	49.0
Potential Net Cost	-48.7	-28.2
Buffer Purchases	15.4	8.2
Buffer Sales	11.0	9.6
High Cost Estimate		
Buffer Net Cost	10.7	3.2
Potential Net Cost	-46.6	-27.0

Notes : i. Figures in parentheses are standard deviations.

ii. High cost estimates are based on higher storage costs.

TABLE VIII

DISTRIBUTION OF NET OPERATING COST OF BUFFER STOCKS

(Per cent)

Interval (mil. $)	Probability	
	CS1	CS2
-20 or less	17.8	19.7
-20-10	3.1	5.0
-10-0	15.8	5.1
0-10	28.0	40.1
10-20	4.9	12.2
20 or more	31.0	17.9

Summary of Findings

The development of a complete jute sector model suitable for examining the implications of a wide range of policy issues has been a major addition to existing research on the economics of jute. Lack of information on public policy variables and the presence of directly non-observable explanatory variables led to the use of proxy variables in estimating supply and demand parameters. The results of econometric estimations judged by the criteria of bias, efficiency and consistency were nevertheless very good. Price risk was found to be an important determinant of both acreage and storage decisions. The 2SLS estimate of price elasticity of export demand was found to be statistically no different from unity. This evidence is in direct conflict with the widely held view that raw jute export demand is significantly inelastic. Both these findings have important implications for price stabilization policies as has been discussed already.

Validation of the model showed that it was able to approximate the historical record of prices and other endogenous variables reasonably well. The performance of the model while good, can be improved further. Yield prediction was unsatisfactory. Use of predictors such as fertilizer and water-use in jute cultivation should improve the prediction of yield behaviour, and hence supply behaviour. This is of central importance since poor prediction exaggerates the effects of random weather shifts in the model, ultimately causing confidence intervals around buffer stocks and cost predictions to be very high. Attempts to control for the effects of yield risk and important policy variables such as price supports, must be made to improve supply predictions. On the demand side, direct measurement of cross-price effects of synthetic substitutes should be attempted. In this case, the constraint in implementing the suggestions just made was lack of information.

Turning to policy analysis, three alternative scenarios, FM, CS1 and CS2 were generated, representing two types of policies, viz., free market or 'business-as-usual', and complete price stabilization. Two scenarios of the complete stabilization policy differed in terms of storage parameters. Complete price stabilization policy was defined by controlled operation of maintaining the growers' level raw jute price to within $\pm 7.5\%$ of the long-run equilibrium price (given by the trend price).

It was found that under CS1 (the hypothetical public stocks agency had no stocks at its disposal and was not constrained in its carryout) a 55% reduction in price instability could be achieved. Producer revenue increased by $ 4 million and its stability increased somewhat. Total export earnings changed marginally, becoming somewhat less stable. The large reduction in price stability was achieved at a net cost of $ 8.7—$ 10 million, depending on the storage cost estimate used. The buffer agency was a net buyer with an expected stock size of 210,000 tons. The dispersion of both storage cost and buffer stocks was very large, the former being several times large than the mean and the latter almost as large. Thus, statistical interval predictions for both expected buffer stocks and storage costs would be very high, forcing a potentially enormous burden on the agency.

In the final set of simulations, i.e., CS2, storage parameters were changed. No more than 179,000 tons of raw jute could be accumulated by the public agency, and it was allowed to begin functioning with 139,00 tons of raw jute at its disposal. This may be considered the more realistic price stabilization scenario. Beginning stocks of 139,000 tons were assumed to be purchased in the open market at the prevailing price. The effect of such a bulk purchase on market price, at any given time, is not considered in this analysis.

The expected price declined as a result of the changes in storage parameters. Price instability is reduced by 27%. Producer revenue declines by $ 2.4 million since the outward shift of the supply function is more than offset by the decline in mean price. Total export earnings increase by $ 1.6 million. While producer revenue is somewhat stabilized, export earnings show a marginal tendency to be destabilized. The buffer agency is a net seller (though negligibly so) with an expected buffer stocks size is of 117,000 tons. The average net cost of buffer operations ranges from $ 1.9 —$ 3.2 million. These net cost estimates are reasonable and do not adversely affect the mean and variance of producer and export earnings. The probability of success of the price stabilization exercise as such, is estimated at 59%. In either stabilization scenario, the buffer agency is able to cover its operational expenses, if the stabilization programme is discontinued at any time. However, it was assumed that the residual buffer stocks could be disposed of in the market without significantly affecting price.

VI. CONCLUSIONS

Generally, the results of simulated public stocks policies demonstrated that the large year-to-year jute price swings can be effectively contained at a reasonable net cost without aggravating producer earnings variability. However, there is a tendency for export earnings to be destabilized. The result in this regard, depends to a large extent upon the value of the price elasticity parameter used in the analysis. There is, therefore, still a great need to continue exercises to estimate the price elasticity of export demand for jute. Our estimate of unit elasticity of raw jute export demand requires corroboration. Based on the results of the present study, it seems that there is a trade-off between price and income stabilization.[19] Stable and continuous economic development is contingent upon the stability of earnings, whereas the long-term future of jute requires price stablity and low relative prices. Jute policy must address this trade-off. The long-term policy objective must, however, be to diversify the end-uses by developing new products and seek new markets in the developing world within the framework of South-South co-operation. It must be understood that competition from synthetic substitutes reflects a structural advantage in the form of advanced technology possessed by industrial countries. Bangladesh cannot hope to match such technological skills, at least for a good many years to come. Jute policy must, therefore, consider the matter of price-setting within this broader context.

The policy simulation results also show that producer incomes decline as result of price stabilization CS2. Though the decline is not significant in per capita terms, the existing skewness in the distribution of farm incomes suggests that the impact of a decline in producer earnings will be highly inequitable. Since declines in existing farm income levels could have serious effects, any price stabilization scheme must include as a corollary, some policy to offset the decrease in incomes.

Two important considerations with respect to financing of a buffer scheme of the type envisaged here, need to be mentioned. First, the scheme would stabilize the world raw jute market (Bangladesh raw jute price being the world price) and Bangladesh would bear the entire market risk. Hence, Bangladesh alone cannot be expected to assume the entire financial burden. Secondly, the opportunity cost of financial resources are very high in Bangladesh. Thus, Bangladesh can assume the stabilization burden only if there is adequate funding commitment from external sources. Tariff and non-tariff burriers to jute, particularly in Western Europe and Japan have been devised to tilt the terms of exchange in favour of synthetics (Ahmad, *et al.* [1]). In the short-run, jute policy must focus attention on trade

[19] It is quite plausible that for the post-1976/7 period, the raw jute export demand elasticity with respect to price is significantly greater than unity, in which case this trade-off is stronger than suggested by the results of this study.

liberalization to secure better market access in the traditional jute markets. The issue assumes greater importance with a price stabilization scheme. The results have shown that reduced price variability increases the size of buffer stocks. If barriers to entry continue to constrict foreign demand, the size of buffer stocks would become even larger imposing perhaps, an unbearable burden on the financial capability of Bangladesh even if it were to contribute partially.

Even though the results of policy analyses point to the feasibility of a jute buffer stocks scheme, some more research is required to strenghthen this case. The moot issue in the jute market is not stabilization, but the instruments to be used to achieve this end. Analysis of a direct income stabilization scheme supported by buffer stocks will be a complement to this study. A tax-cum-subsidy policy may be implemented to stabilize prices as an alternative to a buffer stocks scheme. Yet another socially less costly alternative may be a compensatory financing policy that directly stabilizes export revenues. These policies could easily be analyzed within the framework provided here. The anaylses conducted in this study suggests that the critical problem of price variability in the jute market is difficult but not impossible to remedy.

Appendix A

ANALYTICS OF RISK SENSITIVITY OF THE MODEL

When price risk is included in the model, parameteric shifts can be expected in both supply and demand. The net outcome could have strong implications for public storage policies. A simple, formal presentation of the effects of modelling risk is given below. We assume that (i) price risk affects producers and private stocks traders decisions additively, (ii) supply is pre-determined and, (iii) the underlying demand function is linear in the price range being considered.

1. Price Stabilization Effects on Risk Averse Producers

Let the supply function be implicitly defined as,

$$Q_t\,(P_{t-i},\,R_t),$$

where, Q_t is production at time, t, P_{t-i} is lagged price and R_t is price risk perceived by the producer at time t. $\delta Q_t/\delta P_{t-i} > O$, by the law of supply, and risk aversion implies that $\delta Q_t/\delta R_t < O$. Let the explicit functional form of the supply curve be,

$$Q_t = cP_{t-i} + rR_t + A$$

where, $c > r < O$ and A is the effect of exogenous policies. The total differential of the supply function gives the full effect on Q of changes in the R.H.S. variables. If only P_{t-i} changes while the perceived risk level associated with P_{t-i} remains unchanged, we have,

$$dQ = c\ dP_{t-i}$$

i.e., the change in Q is directly proportional to the change in P_{t-i}, c, the price response parameter being the factor of proportionality. However, effective price stabilization reduces the price variance, which provides a readily usuable measures of the producer's notion of risk associated with price. Thus, if the price level P_{t-i} is raised as a result of price stabilization, a simultaneous reduction in price risk will shift the supply function outward, i.e., producers will produce more at each price level. The total effect on supply is, therefore, given by,

$$dQ = cdP_{t-i} + rdR_t$$

For a small increase in P_{t-i}, supply will increase by c, while a small reduction in price risk will raise supply by r. The total effect on production of these changes, will depend on the magnitude of the response parameters c and r. In case of an increase in P_{t-i} in the course of price stabilization, the effect on Q is an unambiguous increase. But, model predictions would be underestimated if risk aversion of farmers were ignoied. The foregoing analysis also shows that the degree of under-estimation really depends on the magnitude of r. If $r \simeq 0$, ignoring risk response does not bias supply estimates.

If P_{t-i} falls as a result of price stabilization, then the effect on supply, Q_t may no longer be an unambiguous decline. A small decrease in P_{t-i} will lower Q_t by c, but price stabilization will cause an outward shift in the function by r, raising output. The net outcome of these two contradictory tendencies depends again, on the response parameters, c and r. The important thing is that supply may not actually decline even if price drops in response to a price stabilization policy, because of a risk effect. Policy makers must take serious note of the analytical result that with price stabilization, supply is likely to increase more than the predictions based on supply price elasticities. This means larger buffer purchases and storage and hence moie funds. But, as stated earlier the size of extra purchases depends on the magnitude of r, the risk response parameter.

2. Simultaneous Market Demand and Private-Public Storage Interaction

Total raw jute market demand is the sum of domestic mill consumption demand (m), export demand (x) and private storage demand (s). Let these three demand structures be defined as,

$$\sum_{i} Q_t\ (P_i) + Q_s\ (P,\ R),$$

where, $i = m$, x and Q, P, R represent quantity demanded, price and price risk, Private storage demand is expected to be risk responsive, since storage activity profits from price variations. Thus, $\delta Q_i / \delta R > O$, i.e., private stock-holders are risk takers. Also as per expectation $\delta Q / \delta P < O$, in each case. Now, let P_L and P_u define the lower and upper limits, respectively, of a control price band to be enforced by a hypothetical buffer agency. The two price limits, therefore, act a triggers for buffer action. P_L and P_u simultaneously define quantity limits, Q_u corresponding to P_L and Q_L corresponding to P_u, given the market demand function. Thus, if production, $Q > Q_u$ the buffer agency must purchase raw jute until $Q = Q_u$. Similarly, if $Q < Q_L$, buffer agency must sell till $Q = Q_L$ and, no buffer action is required if $Q_L < Q < Q_u$. Thus, Q_L and Q_u can alternatively be viewed as triggers for buffer operations.

If supply, $Q > Q_u$, buffer purchase is $Q - Q_u > O$ and, $P = P_L$ after buffer purchase. At P_L, the decrease in mill consumption and export is,

$$dm + dx = b_o \ dp + b_1 dp = (b_0 + b_1) \ dp$$

where $b_0 < O$ and $b_1 < O$, are the partial mill consumption and export response parameters. The decline in private storage is,

$$ds = b_1 dp + ndr$$

where $b_2 < O$ and $n > O$ are both response parameters with respect to price and price risk. Price stabilization reduces price variability (R) and hence causes shifts in the private storage demand. This is the paramount analytical point in understanding private-public storage interaction. Thus, the buffer purchase required to raise market price P to the floor price, P_L, comprises of displacements in all three markets, mill consumption, export and private storage. In differential terms the total displacement is given by,

$$dQ = dm + dx + ds$$

Thus, two points of great importance to policy makers emerge from the foregoing analysis.

i. The amount of purchase, dQ will be understated if storage risk response is ignored.

ii. The buffer agency has to carry (purchase) not only stocks released by the private storage trade, but also consumption foregone by domestic mills and foreign importers.

Thus, purchases and sales depend critically on the values of response parameters.

3. Price Stabilization and Buffer Action

Assume that the market demand and supply are given by Q_t (P, R) and Q_1 respectively, such that market price is $P_1 < P_L$. Buffer action must consist of the purchase of theamount of $Q_1 - Q_1(P_1, R_1)$, to raise P_1 to P_L. With price stabilization, market supply will respond favourably. Let supply $= Q_2 > Q_1$ as a result of price stabilization. Equilibrium price is P_2 derived from the condition, $Q_2 = Q_1 \ (P_1, R_1)$ and is unequivocally below P_1. Thus, buffer purchase $Q_2 - Q_1 \ (P_1, R_1) > Q_1 - Q_1$ (P_1, R), since $Q_2 > Q_1$.

Clearly, this is an interim equilibrium solution, since $\delta Q_L / \delta R < O$, i.e., market demand (being a sum of foreign and domestic input demand and storage

demand) must shift negatively if price instability is reduced. Let the shifted market demand be given by $Q_1(P, R_2)$ where, $R_2 < R_1$. With supply $= Q_2$, price drops further to $P_3(< P_2 < P_L)$. Therefore, an even larger buffer purchase given by $Q_2 - Q_1\ (P_1, R_2) > Q_2 - Q_1\ (P_1, R) > Q_1 - Q_1(P_1, R_1)$ is required.

To demonstrate the effect of producer and stock-holder's risk responsiveness on buffer sales, let demand and supply be such that market price is $P_4 > P_u$, where P_u is the upper limit of the control price band. With supply at Q_3 and demand given by $Q_1\ (P, R)$, the buffer agency will have to sell the amount $Q_1\ (P_u, R_1) - Q_3$ to bring market price, P_4 down to P_u. Now, with price stabilization price risk is reduced, and therefore, supply will increase, while the demand will shift negatively. Let the post-stabilization supply be $Q_4 > Q_3$. Clearly the buffer sale is given by $Q\ (P_u, R_4) - Q_4 < Q\ (P_u, R_1) < Q_3$. If, the inward demand shift is also considered buffer sale further reduces to $Q\ (P_u, R_2) - Q_4 < Q(P_u, R_1) - Q_4$, since $R_2 < R_1$.

The foregoing analysis shows that price stabilization increases buffer purchases and reduces buffer sales, when price risk response of producers and stock-holders— is considered. The size of the inceasc in purchase and decrease in sales depends, however, on the relative strengths of the response parameters. On the average, predicted buffer stocks would tend to be higher when the price risk response is modelled explicitly, compared to predictions from a model that ignores price risk. Thus, stabilization studies ignoring risk-response understimate the size of buffer stocks. In several commodity markets, price stabilization attempts resulted in much larger-than-predicted buffer stocks. The most recent example can be found in the Indian jute buffer stock scheme, where buffer stockpiling had reached crisis proportions in 1980-81. The responsiveness of producers and private stock-holders to changing price risk levels induced by the stabilization scheme itself, may well have caused the large stockpiles. Efforts must continue to measure risk response of market agents accurately, since the parameter could play a crucial role in determining the success of a price stabilization scheme.

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Choice of Techniques in Small Scale Irrigation in Bangladesh*

by

Md. Belayet Hossain**

The study is an attempt to examine the relative efficiency of indigenous labour intensive devices *vis-a-vis* imported mechanized techniques regarding small scale irrigation in Bangladesh. Three indices, viz., the cost effectiveness criterion, the benefit-cost (B/C) ratio and the internal rate of return (IRR) have been used ; each index has been estimated both at market prices and at shadow prices. Heavy subsidy on the mechanized techniques makes them cost advantageous over the indigenous devices. But the financial cost estimation without subsidy as well as the economic cost estimation shows the reverse situation. All irrigation devices are found to be quite desirable and worthy, as reflected by the B/C ratio. However, the indigenous devices seem to be more profitable than the mechanized techniques to an individual as well as to the society. Government objectives in terms of increasing irrigation coverage, the expansion of employment opportunity and the reduction of income inequality can, to a great extent be facilitated through the reduction/removal of subsidy from the machanized techniques.

I. INTRODUCTION

The importance of irrigation in increasing food production can hardly be exaggerated in Bangladesh. Although a good number of studies have been conducted on irrigation, few have been focussed on the relative efficiency of one device over another. Hannah [8] made a comparative analysis on three alternative ground water techniques, viz., Deep Tubewell (DTW), Shallow Tubewell (STW) and Hand Tubewell (HTW) in terms of their economic and social appropriateness in Bangladesh. This study has many limitations viz.,(i) it used only cost effectiveness criterion which is not an absolute measure of desirability of an investment project ; (ii) with cost estimate, irrigation projects cannot be compared with other projects outside irrigation sector ; (iii) it was confined to the ground water techniques, ignoring the

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surface water techniques ; (iv) it arbitrarily determined the shadow wage rate for unskilled labour without any justification ; (v) it did not pay any attention to the implications of different techniques. Thus, the present study attempts to see the relative efficiency as well as the relative appropriateness of the imported capital intensive irrigation techniques as opposed to indigenous labour intensive devices. This sort of comparative analysis among the alternative techniques is necessary for the choice of an appropriate technique which is very crucial now in Bangladesh.

Our study will focus on small scale irrigation techniques excluding the large scale irrigation which covers only 6% of the total irrigated area. At present six small scale irrigation methods are in use in Bangladesh. These are (i) Dhone and swing basket, (ii) Low Lift Pump (LLP) ; (iii) Deep Tubewell (DTW) ; (iv) Shallow Tubewell (STW) ; (v) Hand Tubewell (HTW) and (vi) Dugwell (DW). The first two methods are used for lifting surface water and the latter four are used for lifting ground water. Among the above methods, Dhone, HTW and DW are mainly operated by manual labour and hence they may be called manually operated indigenous devices; while the other three methods viz., LLP, DTW and STW are operated by fuel/power; so they may be called fuel (power) operated mechanized techniques. We have no choice between the surface water and the ground water, as either source is not enough to irrigate all the cultivable land in the country during the Winter season. And hence, the surface water techniques cannot be compared with those of the ground water techniques. Therefore, techniques within each group will be compared and be ranked among themselves.

II. METHODOLOGY

Three different criteria have been employed in our comparative analysis of different irrigation techniques. These are (a) the cost effectiveness criterion ; (b) the benefit-cost (B/C) ratio and (c) the internal rate of return (IRR). Each of these indices has been estimated at market prices as well as at shadow prices.

The cost-effectiveness criterion is applied under the assumption that the sources of irrigation water do not make any significant difference to the benefit. This assumption seems to be plausible because once the required water is available at the field (whatever the source is) there should not be any difference in yield.[1] Cost per acre has been estimated using the following formula.

[1]The mechanized irrigation techniques involving leveling, drainage, water control etc. generally bring about higher yield than the traditional techniques. But such mechanized techniques are outside the scope of the present study. Our study deals only with those mechanized techniques which are used for watering in the field as it is done by traditional devices.

$$\text{Cost per acre} = \left(\frac{A}{B} + C\right) \div D$$

Where B = $(1+r)^n$

A = total capital cost

r = discount rate

n = economic life of capital goods in years

C = seasonal operation and maintenance cost

D = area irrigated (in acre) Per Pump/well per season.

Cost estimates cannot be used to test the viability of a project, however, ranking among the techniques can be made through it. The limitations of cost-effectiveness analysis suggest the use of B/C ratio as well as IRR. An estimation of either of these indices will not be of much problem in financial analysis, as it uses market prices of inputs and outputs. But it is the economic analysis where we will face some difficulties, particularly in the estimation of shadow prices and shadow wage rate. Some qualifications about these shadow prices are necessary.

Shaddow Prices

Bangladesh, being a small country, cannot influence prices in the world market; hence world market prices (border prices) are considered as the shadow prices of all tradeable inputs and outputs, following Little and Mirrless.[2] But the estimation of shadow prices of non-tradeable goods which is generally done by breaking non-labour costs down into tradeable goods is a very difficult and cumbersome procedure. So, we shall emphasise on the direct opportunity cost of non-tradeable goods. For example, bullocks used in ploughing are non-tradeable; but they have competitive markets in the country side ; therefore domestic market prices may be considered as the shadow prices of this input provided that no other distortion exists. This domestic market prices have been converted into border prices using a conversion factor.

Shadow Wage Rate for Unskilled Labour

All traditional devices of irrigation are operated by unskilled labourers among which family labour is predominant. Since, farmers do not incur any financial cost for family labour, so family labour will not be valued in financial cost estimation. It has been deduced from different studies [7 ; 9 ; 12] that on the average 34% (1/3) of the total labour required to operate traditional devices is hired and the remaining 2/3 is family labour [11, pp. 58-59]. A good number of reasons lead us to believe that

[2]In estimating shadow prices for tradeable goods, trade and transport margins have been included.

the opportunity cost of family labour used to operate traditional irrigation methods is not different from zero. These are : (i) all indigenous devices can be operated in the off-time, particularly in the evening and in the early morning; (ii) other family members who are not in the labour force such as students, children and house-wives can operate these devices ; (iii) those family members involved in non-agricultural trades can also help in the operation of these methods without harming their profession ; (iv) traditional methods are mostly practised by small farmers whose supply of family labour is generally greater in relation to their landholding ; (v) the demand for labour is relatively low during Winter season when irrigation is mostly practised and hence the possibility of getting alternative employment elsewhere by the farmers themselves (during this season) is very low ; (vi) even within the Winter season, irrigation is practised in the period between the transplantation and the harvesting period when farmers have the least farm activities of that season.

Unlike family labour, hired labour should have positive opportunity cost ; because hired labour is mostly used by relatively larger farmers whose supply of family labour is low (in relation to landholding). Because of the high magnitude of unemployment and under-employment which is estimated at 34% of the total labour force in Bangladesh [15, p. 418], it is widely believed that shadow wage rate of all unskilled labour is well below the market wage rate. For simplicity and also to make our estimate more conservative, we would like to consider the market wage rate as the shadow wage rate for hired labour whose opportunity cost is assumed to be positive.

The Numeraire

Taka equivalent of convertible foreign currency at the official ex-change rate will be used as the 'numeraire' (unit of account) in our economic analysis. The value of all tradeable inputs and outputs can directly be used in this unit of account without any adjustment [14, p. 146]. Unlike the tradeable goods, the value of non-tradeable goods needs to be adjusted which is to be converted into taka equivalent border price using standard conversion factor (SCF) as suggested by Little and Mirrlees [14, p. 217]. An estimation of SCF is of some difficulty. However, Khan [13, pp. 107-27] estimated the SCF for different non-tradeable goods as well as primary factors in order to see the sectoral priorities of Bangladesh economy. The conversion factor of all non-tradeable goods (average) is estimated at 0.72 and it is 0.875 for shadow wage rate. These two conversion factors will be used as the SCF in our economic analysis.

Discount Rate

For Financial Analysis. The interest rate on long term loans and advances (institutional) was arround 12% p.a. during 1978/79. The availability of institu-

tional credit is very limited in agricultural sector and it induces farmers to borrow from non-institutional sources. The study by Asaduzzaman and Hossain [3] shows that institutional source accounts for about 65 % of the total credit used in capital expenditure and the remaining 35 % is accounted for by non-institutional sources. Another study [5] records that about 60 % of non-institutional credit is interest free as it is mostly taken from friends and relatives. The same study documented that the average interest rate of non-institutional credit (excluding friends and relatives), was around 50 % p.a. Having these information, we estimate the market interest rate (weighted) of all agricultural credit used in capital expenditure to be around 15 % p.a.

For Economic Analysis. As scarcity of credit in agricultural sector always exists, market interest rate cannot reflect the true opportunity cost of borrowed money. The social discount rate should be estimated on the basis of opportunity cost of marginal unit of capital. Khan [13] built a duality model of linear programming for a sectoral planning of Bangladesh economy. Using the data upto 1969/70, he estimated the shadow prices of both inputs and outputs for different sectors. His findings show that the shadow price of capital (shadow interest rate) in agricultural sector is around 16 % p.a. whereas the institutional rate of interest was about 9 % p.a. for the same period i.e., the shadow interest rate was about 75 % higher than the institutional rate of interest. Following the same margin between the institutional and the shadow interest rate, we estimate the shadow interest rate for the year 1978/79 to be around 20 % p.a.

Life of Different Techniques

Based on IDA report and other information available, the figures shown in Table I will be considered as the economic life of different irrigation techniques.

TABLE I

LIFE OF DIFFERENT TECHNIQUES

Techniques	Life (in years)
Surface Water	
Dhone	5
LLP	7
Ground Water	
DTW	10
STW	7
HTW	10
DW	3

Actual Area Irrigated Per Pump/Well

For area irrigated per Pump/Well, we use three estimates viz., low, medium and high as shown in Table II, based on the findings of different studies[1;4;7;9;10;12]

TABLE II

ESTIMATES OF AREA IRRIGATED PER PUMP/WELL

Techniques	Estimates (in acres)		
Surface Water	Low	Medium	High
Dhone	1	1	1.20
LLP	30	35	40
Ground Water			
DTW	35	40	45
STW	7	9	11
HTW	0.5	0.5	0.75
DW	0.3	0.3	0.40

Source : [1], Appendix table].

Benefits

The benefits of our irrigation projects can be defined as the increase in the net value of output due to the implementation of projects. That is, in estimating the benefits we have to compare the impact "With" and "Without" the projects. The difference is, in general, the net additional benefit arising from the projects. Without the implementation of irrigation projects, farmers might grow non-irrigated crops which might bring some net value but it is foregone if irrigation projects are implemented. So, the net value of the best alternative crop (without irrigation) is to be deducted from the net value of irrigated crops in order to estimate the benefits of irrigation.

The net value of output with irrigation is estimated by deducting the total production cost (excluding irrigation cost) from the total value of product with irrigation. The value of total output (for a particular year) associated with each technique is estimated as the average yield (in maunds) times price per maund times the area irrigated by each Pump set/well. In financial analysis, we use government procurement price (GPP) for the year 1978/79 which is Tk. 86 per maund of paddy.

This is because, GPP is guaranteed price and sometimes, particularly under the levy system, farmers have no other alternative but to sell to the government. However, for economic analysis, c.i.f. price is estimated at Tk. 125 per maund of paddy.[3] Following the *Costs and Returns Survey*, by the Ministry of Agriculture the average cost of *Boro* (HYV) Production is estimated at Tk. 1287 and Tk. 1979 per acre at market and shadow prices respectively.

Some non-irrigated crops like oil seeds are grown in some lands but some lands also remain fallow during Winter season. It has been noticed that mainly three Winter crops, namely *masur*, *khesari* and mastard generally do not require any irrigation water, and these crops can be grown throughout the country. Therefore, we assume that farmers could easily grow any of these three crops if irrigation water is not available to them. It has been estimated that of the three crops, mustard has the highest value added which is Tk. 599 per acre at market price. The corresponding figure at shadow prices is estimated at 914 (in terms of Tk. equivalent border price). Therefore, the value added (net value of output) of mustard crop will be considered as the opportunity cost of irrigated land and it will be deducted from the net value of irrigated crop in estimating the benefits of irrigation.

Sources of Data

The study will be based on secondary data which have been gathered from different official sources. Cost statistics of all modern techniques including HTW have been collected from BADC. Operation and maintenance costs have been gathered from BADC's own survey report (1978) conducted by Implementation Division. No official cost statistics of Dhones and Dugwell are available. Some cost figures on Dugwell have been documented in Hamid, M.A. *et al.* [7, pp. 217-20], based on the survey conducted by Siddique, A.B. We use those statistics with some adjustment in estimating the cost of Dugwell. For Dhone, we have collected its cost statistics by interviewing three users from three different places who have long experience is this device. As this device needs a hollowed log (wooden), a beam (made of betel nut tree or of bamboo) and some bamboo poles for its installation, its cost does not differ much from place to place or from person to person.

III. FINANCIAL AND ECONOMIC COST ESTIMATES

Financial Cost Estimates

LLP sets and DTW are owned by BADC and they are only rented out to the group of farmers at a subsidized rate. So, in financial cost estimates we consider

[3]C.i.f. price of clean rice is recorded Tk. 5139 per M. Ton for 1978-79. We adjust at a rate of one ton equals 1.02 M. Tons, one ton of paddy equals 0.65 tons of clean rice and one ton of paddy equals 27.22 maunds of paddy.

6—

two situations, particularly in case of LLP and DTW—one is without subsidy and the other is with subsidy. The situation without subsidy shows the costs which farmers would incur either if they owned the techniques or if there is no government support. Table III shows the financial cost estimates of different techniques without

TABLE III

FINANCIAL COST ESTIMATES (WITHOUT SUBSIDY)

(Cost per acre in Tk.)

Estimates of Command Area	Surface Water		Ground Water			
	LLP	Dhone	DTW	STW	HTW	DW
Low	680	480	1,554	1,386	1,230	1,340
Medium	583	480	1,360	1,078	1,230	1,340
High	510	400	1,209	882	820	1,005

Source : [11, Table 4.2 and 4.4].

subsidy. In surface water, a set of Dhones incurs a cost of Tk. 480 per acre as against Tk. 583 for LLP (under medium estimate) i.e., Dhone has a cost advantage over LLP by about 20 %.[4] Among the ground water techniques, DTW and STW incur a cost of Tk. 1,360 and Tk. 1,078 per acre (under medium estimate) as against Tk. 1,230 and Tk. 1,340 for HTW and DW respectively. This implies that STW has a cost advantage over HTW and DW by about 10 to 20 % ; DTW has a cost disadvantage over HTW by about 10 % but it is very much competitive with DW. Thus, indigenous techniques are either enjoying cost advantage or are competitive with those of mechanized techniques (except STW). The reason behind this is that indigenous techniques are mainly operated by family labour and consequently, the operation cost of these techniques is very low. Between DTW and STW, the latter's cost advantage over the former is about 26 %. This implies that STW is relatively more efficient than DTW. Among others, one important factor behind its relative efficiency is that it is smaller and more suitable than DTW, and thus better utilized.

[4]LLP usually can lift water 15 feet or more whereas Dhone can lift water only upto 6 feet. If two Dhones work vertically one after another (which farmers sometimes practise to lift water at a greater height) then the same height as one LLP set does can be covered. So, to compare Dhone with LLP, we assume two Dhones always work vertically and hence two Dhones are considered as one set.

Since the mechanized techniques, particularly LLP and DTW are highly subsidized, a farmer actually incurs much less cost than otherwise. The cost per acre with subsidy for LLP and DTW is shown in Table IV.

TABLE IV

COST (WITH SUBSIDY) INCURRED BY THE RENTERS OF LLP AND DTW

Estimates of Command Area	Cost Per Acre (in Tk.)	
	LLP	DTW
Low	302	336
Medium	259	293
High	227	261

Source : [11, Table 4.3 and 4.5].

The table shows that farmers renting LLP and DTW are actually incurring a cost of Tk. 259 and Tk. 293 per acre (under medium estimate) respectively ; whereas they would have to incur Tk. 583 and Tk. 1,360, respectively, if they owned it or if there was no subsidy. This implies that the users of LLP and DTW are receiving an amount of subsidy of 55% and 78% of the total cost per acre respectively. STW users also receive subsidy in the sense that farmers may receive as much discount as 20%. But none of the indigenous devices (viz., Dhone, HTW, DW) gets any support in terms of subsidy from the government. While LLP and DTW are the most expensive techniques without subsidy in surface and ground water techniques, respectively ; but with subsidy they become the cheapest techniques. In this respect, indigenous technique say Dhone becomes dearer than LLP by about 46% and other indigenous ground water devices say HTW and DW become dearer than DTW by some 250 to 300%.

Economic Cost Estimates

Economic cost estimates looked at from the society's point of view is presented in Table V. In surface water, under medium estimate, Dhone involves a cost of Tk. 406 per acre as against Tk. 571 for LLP ; but in ground water, DTW and STW incur a cost of Tk. 1,340 and Tk. 947 per acre as against Tk. 1,200 and Tk. 1,163 for HTW and DW, respectively. Thus, all indigenous devices have cost advantage over the mechanized techniques (except STW) at varying degrees as it is found in financial cost estimates without subsidy. However, the cost advantage of indigenous methods over the mechanized methods increases in economic cost estimates as compared to that of financial estimates (without subsidy). The reason is that,

almost all inputs of indigenous techniques are non-tradeable ; so when they are converted into border price, their magnitude has been reduced. Thus, our finding on cost estimates is that with subsidy, the mechanized techniques, particularly LLP and DTW are the cheapest techniques to the users. But their ranking becomes reversed if subsidy is withdrawn. It has been found that the relative ranking of each technique remains unchanged both in financial (without subsidy) and in economic cost estimates. However, this finding is subject to the assumptions regarding the share of hired labour in the operation in indigenous devices as well as the opportunity cost of family labour made earlier.[5]

TABLE V

ECONOMIC COST ESTIMATES OF DIFFERENT TECHNIQUES

Estimates of Command Area	Cost per Acre (in Tk. equivalent border price)					
	Surface Water		Ground Water			
	LLP	Dhone	DTW	STW	HTW	DW
Low	666	406	1,531	1,218	1,206	1,163
Medium	571	406	1,340	947	1,206	1,163
High	500	338	1,191	775	804	872

Source : [11, Table 4.6 and 4.7].

IV. THE BENEFIT-COST (B/C) RATIO AND THE INTERNAL RATE OF RETURN (IRR)

In this section, benefits as well as costs are estimated on the basis of medium estimate of command area since it is considered as the best estimate. Our financial estimation of B/C ratio and IRR which is presented in Table VI is estimated considering that the techniques are owned by the farmers themselves (without subsidy).

Financial and economic analysis clearly reveal that all irrigation devices under study are desirable and viable, as reflected in the B/C ratios from the point of view of the individual as well as the society (B/C ratios $>$ 1.0).

[5]For example, if the share of hired labour in the operation of traditional device is increased to 50%, the cost advantage of indigenous devices over the mechanized techniques no longer remains ; rather the former devices become cost disadvantageous over the latter techniques.

TABLE VI

ESTIMATION OF B/C RATIO AND IRR

Techniques	Financial		Economic	
	B/C Ratio	IRR (in %)	B/C Ratio	IRR (in %)
Surface Water :				
LLP	2.56	782	3.55	Infinity
Dhone	2.82	Infinity	4.57	Infinity
Ground Water :				
DTW	1.15	22	1.60	56
STW	1.41	46	2.57	211
HTW	1.19	32	1.67	102
DW	1.05	77	1.63	Infinity

Source : [11, Table 5.3 and 5.4].

In terms of IRR, small scale irrigation techniques are found to be highly profitable— surface water techniques being more profitable than ground water techniques both at market and shadow prices. This implies that as long as surface water is available, it should be given priority. The IRR of all techniques increases considerably in economic analysis as compared to that of financial analysis which indicates that investment in irrigation is more profitable to the society than to an individual. The IRR of Dhone (both in financial and economic estimates), LLP (in economic estimate) and DW (in economic estimate) becomes infinity. Two reasons may be put forward for this. Firstly, all these techniques, particularly for Dhone and DW require very small capital cost in relation to their benefit ; consequently, their net present worth approaches zero only if IRR tends to infinity. Secondly, their working life is too short which may result in an upward bias in the calculation of IRR.

The IRR of LLP (in financial estimate) is very high which is about 782 %. high magnitude of benefit in relation to capital cost may be responsible for this. In financial estimation, IRR of DW and HTW are about 77 % and 32 % and the corresponding percentage for DTW and STW are 22 and 46 respectively. The same in economic estimation is infinity and 102 % for DW and HTW respectively, as against 56 % and 211 % for DTW and STW, respectively. Thus, among ground water techniques, indigenous devices seem to be more attractive than the mechanized techniques. Particularly with respect to DTW to an individual as well as to the society. However, the attractiveness of indigenous devices depends on the extent of the supply of family labour as well as their opportunity cost.

No other study conducted so far dealt with the economic estimation of IRR with respect to any of the above techniques. Some financial estimations of IRR on some of the above techniques are available. Alam [2] estimated the IRR of DTW to be around 50%. Islam [13] observed the IRR of HTW to be around 100%. Our estimates of IRR (financial) for the respective techanique are much lower than these estimates. Firstly, our conservative assumptions throughout the study may be responsible for a relatively low IRR. Secondly, these studies, particularly Islam's one did not take into account the opportunity cost of irrigated land as we did ; and this might cause a substantial upward bias in those estimates.

V. CHOICE OF IRRIGATION TECHNIQUES AND THE AGRARIAN STRUCTURE

The size of land to be irrigated is one of the most important criteria for the choice of irrigation techniques. Because, each type of technique has its own limitation to the command area. The notable features of the agrarian structure of Bangladesh are that it has a very high proportion (about 50%) of small (up to 2.5 acres) holding having the average size of 1.3 acres ; another 40% is the medium holding (2.5-7.5 acres) having the average size of 4.0 acres. Farm holdings are usually fragmented into a number of plots. Each farm on the average is fragmented into more than 9 and the average size of each fragment is only 0.4 acres. Given this scenario of small and fragemented holdings, the questions are of the appropriateness and suitability of one type of technique over the other.

Mechanized Techniques

Farm holdings are so small and fragmented that the existing mechanized techniques with large coverage cannot be used efficiently by an individual farmer alone. Two possible ways may be put forward for their effective utilization [3, p. 10]. These are (a) effective producer's cooperative and (b) private ownership of these techniques. The high concentration in land ownership and the prevalence of share tenancy have developed a patron/client relationship in rural Bangladesh; as a result elites dominate in all decision making bodies including the 'Irrigation Group'. In these circumstances, small farmers cannot have an equal access to water distributed through groups. Consequently, the effective organization in the form of 'Irrigation Group' for the full utilization of indivisible technique is not possible unless and until the existing agrarian structure changes. Given the existing agrarian structure, better utilization of mechanized techniques may be ensured by the emergence of market for irrigation water through private ownership. But this will adversely affect distribution aspect. Because, if this system is allowed to operate, then the smaller farmers may be priced out of the market for irrigation water. Thus,

under the existing socio-economic conditions of Bangladesh, neither the cooperative nor the Private Ownership can ensure the Participation of small farmers in the mechanized techniques.

Indigenous Devices

Almost all indigenous methods of irrigation are relatively more suitable and appropriate for small farmers who are the majority in the society i.e., these devices are divisible enough for small farmers. Small farmers usually have under utilized labour which can be productively utilized in operating these techniques. The capital cost of these devices are so small that farmers themselves can afford them without facing organizational institutional problems. The users of these devices do not need to rely on any factor external to the country unlike the mechanized techniques.

VI. CONCLUSION

Our financial estimates show that all mechanized techniques are profitable enough to the farmers even without subsidy, hence subsidy which serves the vested interest can hardly be justified. There is a high possibility of increasing the irrigation coverage which is one of the prime objectives of government in agriculture if the existing subsidy on irrigation is either removed or reduced [12, pp. 100-102][6]. This is because, (i) efficiency of the mechanized techniques in terms of capacity utilization can be increased by removing/reducing subsidy ; (ii) when the artificial advantage of the mechanized techaniques is taken away by removing subsidy then more farmers might be interested in using traditional methods ; (iii) by reducing removing subsidy from the mechanized techniques, innovation of appropriate irrigation techniques can be encouraged since the existing mechanized techniques are less suitable, as stated elsewhere ; (iv) the supply of irrigation euquipments, spare parts and other related inputs (which are very much scarce due to lack of sufficient budget) can be ensured more by reducing subsidy and this may contribute more to the increase in both irrigation coverage and total production. Thus, government objective of increasing irrigation coverage and the removal of subsidy from the mechanized techniques are consistent.

All indigenous devices are operated by unskilled labour and hence they are highly labour intensive. For example some 90, 100 and 102 mandays of labour are required to operate a set of Dhone, HTW and DW respectively in each season[12,

6 Besides irrigation, subsidy is being provided on other inputs in agriculture as well as other sectors such as urban and industrial sectors. Before reducing or removing subsidy from any sector, it should be evaluated. The situation may be that subsidy on irrigation is more productive than that on other sectors. If this situation arises, the least productive subsidies should be removed first.

Table A. 3, A.7 and A.8]. On the contrary, mechanized techniques do not require any unskilled labour for their operation. Thus, the employment implication of indigenous devices are obvious and significant.

The average size of landholding of the users of LLP, STW and DTW is around 6.8, 9 and 5 acres respectively ; on the otherhand, for HTW, DW and Dhone, it is around 2.8.2 and 2.2 acres respectively [8 ; 11 ; 12 ; 13]. Thus larger farmers make greater use of mechanized techniques than the smaller farmers. In this regard, the existing subsidy on mechanized techniques accentuate the income inequality in rural Bangladesh. Therefore, government objective of reducing income inequality can partially be facilitated through the reduction/removal of subsidy from the meachanized techniques of irrigation.

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An Enquiry into the Nature and Determinants of Polarisation in Personal Wealth : A Case Study Using Handloom Industry Data

by

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It is usually recognised that one of the important determinants of the inequality of the distribution of incomes relates to the distribution of wealth. Not much systematic work appears to have been done about the level and determinants of transactions in wealth in Bangladesh agriculture. This paper seeks to fill this lacuna, in part, and focusses on the levels, tructure and determinants of the flows of wealth in relation to a sample of handloom entrepreneurs. We argue (a) that wealth transactions by respondents who are selling in net terms represent attempts not so much optimise wealth portfolio as to tide over liquidity contingencies stemming from an unforeseen depression in current incomes; (b) that net sales and net purchases of wealth items are largely accounted for by the handloom respondents in the small and large size-classes, respectively; (c) that land and homestead account for the major proportion of the sales and purchases of assets; and (d) finally that favourable access to liquidity, represented by whether one has a running credit limit with a commercial bank, and one's situation on the informational network, as represented by whether one happens to be a dealer in yarn as well as a manufacturer of cloth explain a considerable proportion of the observed variance. The income variable, whenever it was tried, was found to be less effective than either of these dichotomous variables in explaining the variance. The moral seems to be that access to information and sizeable liquidity represent a combination more potent, from the viewpoint of making feasible attractive purchases of assets, than merely one's own high income.

I. INTRODUCTION

In analytical or interpretative contributions on the nature and determinants of development of poor economies, a rivetting of attention, among other things,

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on the inequality of the distribution of incomes has, in recent years, become imperative [1; 2; 6; 11; 13]. Since the right to systematically improve one's economic welfare ought not to be the exclusive privilege of a small proportion of an economy's population, it is of great normative significance not only how fast an economy grows but how equally its benefits are distributed. The question of the causation of inequality of incomes in practice has not, in a given situation, been conducted to anyone's full satisfaction. More particularly, we know little about the nature and determinants of the net accumulation of wealth among agents, about what causes net accumulation to be different among agents or households or among periods. This lacuna is lamentable in that inequality in wealth is among the most important causes of income inequality. In ignorance, one tends, if pressed to discuss the causes of the pattern of net accumulation of wealth, to fall back on the safest possible *a priori* rationalisation, namely, that it is the high-income agents who consolidate their wealth situation by acquiring on a net basis. In other words, the prime determinant of net accumulation is supposed to be one's income. If accepted at its face value, this proposition will mean that a polarised income distribution makes it possible for the well-to-do to enhance their ownership of wealth, and thereby further polarise the ensuing income distribution.

The purpose of this paper is to present an alternative explanation of the pattern of net accumulation of wealth in the specific context of a sample of handloom weavers in Bangladesh. It is being argued that in the handloom sector, being regarded as a case study presumably representative of relatively low-income producers of traditional products on local basis,[1] sale of assets is often triggered by liquidity contingencies, rather than attempted optimisation of asset-mix. It is also argued that the weaver's worldview is overshadowed by a concern about his continued accommodation by the relatively powerful yarn merchants in the latter's preserve. Finally, it is argued that it is not high income as such which is nearly so important a determinant of the level of net wealth accumulation as (a) assured accommodation by institutional credit system, and (b) the ownership of a yarn retailing enterprise. In other words, the paper explores the nature and determinants of the wealth flows within what may be a specimen of a quantitatively important class of producers and small investors of Bangladesh.

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[1]It is not an exaggeration to say that the handloom industry is not merely an important component of Bangladesh's substantial cottage small industry, but can be seen as having a barometric position within it. After food, essential clothing is of the greatest consumer urgency for the masses. As such, to have chosen the handloom industry as our case study cannot be lightly dismissed as misplaced. We shall argue below that, short of concentrating on small and well defined sample there is no reliable way of pinpointing what triggers off the process of distress wealth-transaction in which case the possible relevance of the observed determinants of net accumulation can be duly high lighted. However, it will also be owned that this partial approach study has its own biases which have to be borne in mind.

Before describing how the paper is structured, a rationale may be provided of why it seeks to raise the question of the determinants of net accumulation of wealth in the context of a case study. For, it may well be asked, would it not have been more appropriate to pose these questions in the context of the economy as a whole ? Indeed, since this is a sectoral study, is it not quite conceivable, at least in principle, that there is a significant overlap among those who dominate the structure of net wealth accretions within this sector, and those who do so outside the sector. For, in that case, quite besides the fact that the interlocking of the market for wealth within the given sector will perhaps subsume all other plausible explanatory variables (such as those noted above), any estimate of the broad extent of sectoral concentration (such as presented below) would be rather irrelevant, because the aggregate concentration would be much higher.[2] It is surely important to seek to dilute these qualifications.

It is appropriate to note, first, that we have to discount the possibility of any significant overlap between the handloom sector and the other sectors in referring to desired portfolio for wealth. The handloom industry is a primarily rural enterprise, and, in the conditions of 1976/7, there are good reasons to believe that the really big operators in wealth items elsewhere were jockeying for accumulation of urban wealth, given the marked 'urban bias' of policies. Further, in spite of the large aggregative size of their industry, the hand-weavers are the Bangladeshi occupational equivalent of India's untouchables within her class system : they are a socially stigmatised class. As such, there is no strong social attraction for wealthy agents from outsid ethe industry to seek to establish a bridgehead by buying into the assets of the weavers. Even if, moreover, there were significant overlap, there would still be a good case for concentrating on the details of a well-researched sample of the present type. This is because, first, it helps us to pinpoint accurately the events or developments which may accelerate the net outflow of wealth and, second, because such exercises have implications, both cognitive and policy-oriented, for productive sectors of key importance. On these justifications, then, we seek to create the niche for the present exercise.

The paper is structured as follows. Section II lays out the sources, nature and limitations of the data used in the following. Section III put the paper in its proper temporal perspective, where it is argued, briefly, that the acceleration in the transactions in items of personal wealth observed in the sample in 1976/7 was a result of a quite serious aggregative shortage of yarn which, through the pricing mechanism, drastically reduced mean net weaving incomes in the sample, thus setting off the wealth outflows by mainly small weavers. Section IV presents our findings and major conclusions are covered in Section V.

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[2]For a hypothetical and admittedly extreme example that, in another context, makes clear the relationship between concentration of individual sectors and the nature and extent of overlap among sectors in affecting the level of aggregate concentration, see [12, p. 228, ff].

II. DATA

This paper was conceived as forming a part of a wider study [4]. Since that study outlines the nature and sources of the data in details, we shall touch on the essentials here.

The data used here are from a sample survey 1976/7 of handloom enterprises as a part of an overall study into the relative efficiency of the handloom, powerloom and public-sector weaving establishments in the country. For all classes of enterprise, data were generated for 1975/6 and 1976/7. The handloom respondents were addressed an extended set of questions asking, for each of certain specified items of wealth, about the quantity and, if relevant, value of the wealth items that were bought or sold during 1975/6 and 1976/7. In regard to wealth transactions for present purposes, the acquisition of new looms and/or new miscellaneous weaving implements were excluded. This is done for the following methodological reason. New looms are almost always built to specification. As such, their acquisitions represent transactions which may proceed from somewhat different calculations than those involving used looms. For example, it can be argued that the buying of a second-hand loom may often arise from a desire to take advantage of distress-induced discounts or from repayment at unduly inflated effective interest rates, of debt contracted in the past. On the other hand, the acquisition of new looms may arise, not from desire for bargain prices, but from the perceptions at a long run need for increased capacity. Given this diversity in the underlying causation, it is only called for that we treat new looms separately from used ones. Note that, in so far as we have a handloom weavers' sample, the above diversity in the causation of the acquisition of new versus used asset does not apply to other types of asset, e.g., homestead, cattle, land etc.

The resultant data underlie estimates of net purchase and sales of wealth items, in both physical and value terms, of unit transaction value in each market, the unit price, etc. Because the data exist for two years and since we had supporting evidence presented below, that 1976/7 witnessed a serious depression in the incomes in the handloom industry generally, the data helped us compare two years, one relatively normal, the other not-so-normal.[3] We supplemented these data with indirect information about (a) the access of respondents to the institutional credit markets, and (b) their informational capacity. For a proxy of (a), we used whether or not a respondent had a cash credit limit with commercial banks. Whether the weaver concerned also owned a yarn-selling business in the survey area was used a proxy for.[4] It can be claimed with some confidence that we have a mass of data of a work-

[3]Growth of agriculture, which is perhaps the most influential determinant of prosperity of the weavers, in 1975/6 was 11.7% up on the year before. But in 1976/7, it was down by 3% on 1975/6.

[4]Our identification of the possession of a bank cash-credit limit with an access to the institutional privilege is not difficult to defend, especially as only 6% of the handloom owners have a cash-credit limit with the banks. Since there is strong latent demand for the access to convenient liquidity which

(*Continued on page* 55)

able degree of accuracy, not least because, conducted by a number of specially trained economist-enumerators under the personal supervision by the author, the sample survey was fairly creatively executed and given a high degree of cooperation by the respondents.

III. THE HANDLOOM INDUSTRY IN 1975/6, 1976/7

According to the Bangladesh Bureau of Statistics (BBS), the agricultural output of the country in 1976/7 was down by 3% on 1975/6. Though (GDP) at factor cost in 1976/7 was up 1.6% on 1975/6, the declaration of agricultural output is perhaps more significant to the handloom weavers than a modest rise in aggregate GDP.[5] Perhaps, we should note that by being linked closely to the prosperity of the farm sector which, in Bangladesh over the decade 1971-81, has been rather variable and unpredicatable, the fate of the typical hand-weaver is chequered with economic vicissitudes, which preclude the formation of sizeable reserves upon which to fall back in need. At any rate, in 1976/7, faced with as declaration of farm output, the handloom sector had even less of the upward pricing flexibility for cloth than may have been the case. Average price per yard for our sample in 1976/7 for the sample as a whole was up 18% upon 1975/6 [4, p. 287] which, while conspicuously repressive(with respect to demand) in a market predominated by the poor and increasingly threatened with cheaper imported used clothing, was still considerably short of the inflation of the unit costs of yarn, the largest single cost component taking about 60-65% of total costs. What happens to the price of yarn paid by the weaversa is then of critical importance to their profits. Since about 85% of our sample regard weaving to be their primary occupation [4, Table 4.3], what happens to weaving profits is of critical importance to total incomes of these weavers. It is therefore necessary to have a brief look at the organization of the yarn market of Bangladesh during 1975/6 and 1976/7. This is done in Table I.

The State of Yarn Supply and Prices, 1975/6, 1976/7

First, a methodological justification. In Table I, our focus is, of course, in the years 1975/6, and 1976/7. However, there is a case for putting those years in a perspective only made possible by the inclusion of 1973/4 and 1974/5.

(*Footnote 4 continued*)

the cash credit limit implies, the observation that this access characterises only a select few, prompts the use of the word privilege. It is somewhat more difficult to equate having a yarn-business, besides a cloth-business, with informational power. However, in the weaver's economy with a scarcity of yarn, agents who distribute yarn are, in an important sense, like peers among equals. Other typically come to them for raw materials advice and, in the process, sometime part with potentially valuable confidential information about one's crises, weaknesses, etc.

5 As can be easily imagined, putting the facts in per-capita terms will remove any discrepancy because, in that case, both agricultural output per (rural) capita and the GDP per capita will have be lower in 1976/7 versus 1975/6.

TABLE I

CERTAIN FUNDAMENTAL ASPECTS OF THE YARN MARKET IN BANGLADESH, 1973/4-1976/7[a]

Year	Yarn (mn.lbs.)			Yarn Stock Industry-wide, in Monthly Output Equivalents	Cost of Cotton per lb. (Taka)	Weighted Average Ex-mill Yarn Price (Taka)	Prices and Scarcity Premium on 40's Count		
	Mill Output Surplus	Net Import	Use by Handloom Industry				Ex-mill Price (Taka)	Price Paid by Weavers (Taka)	Scarcity Premium Charged[b] (%)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1973/4	66.7	24.0	77.1	1.57	6.44	13.08	n.a.	n.a.	100
1974/5	60.2 (90.2)	...	51.2 (66.4)	2.72 (173.2)	6.26 (97.2)	17.60 (134.6)	n.a.	n.a.	28
1975/6	84.0 (139.5)	28.0 (116.7)	95.2 (185.9)	2.47 (90.3)	10.88 (173.8)	16.88 (95.9)	18.2 (100)	23.0 (126)	2.7
1976/7	70.4 (83.8)	18.0 (64)	75.1 (78.9)	0.57 (23.1)	14.59 (134.1)	21.58 (127.8)	19.8 (100)	32.1 (162)	31.7

Notes : (a) Figures in parenthesis in cols. (2) to (7) show annual proportionate changes with respect to the previous year. Those in the parenthesis of cols. (8) and (9) show the % difference between the figures in the columns with col. 8 figures equal to 100.

(b) The first two figures in this column are estimates of scarcity premia made by other economists (see sources below).

Sources : Except the first two estimates of col. 10, which are from [14] and [16] respectively, all other data are from primary and secondary sources. For more details, see [4, especially chs. 2 and 5].

In interpreting Table I, we should perhaps start with the figures in col. 5. Industry-wide stock levels, in terms of industry monthly output equivalent, rose to a seriously high level in 1974/5 as a result of the rather chaotic performance by the new-fangled public-sector yarn distributional institutions, and of the farm-sector failure.[6] In May 1975, yarn market was liberalised in favour of market forces, the favourable effect of which on stock levels was reinforced by improvement in aggregative output performance. Stock levels fell somewhat. However, the fact of what seems to be a drastic fall in the stock levels in 1976/7 can be satisfactorily explained only after we look at certain related data. Between 1974/5 and 1976/7, average landed cost of raw cotton, the single most important input into yarn, rose continuously, by about three-quarters in 1975/6 on 1974/5, and further by 34% in 1976/7 on 1975/6. However, there has been little, if any, match between the movement of the unit cotton costs in 1974/5 and 1975/6 : while cotton costs rose by 74% (see col. 6, Table I) BTMC ex-mill prices in fact fell by 4% overall. (This was partly done no doubt to accelerate the lowering of stocks.) This obviously meant that by the beginning of 1976/7, BTMC yarn prices were lagging well behind its matched unit production costs—and the market knew it. Since cotton costs in Taka rose further early in 1976/7, there were widespread expectations about a probably large increase in ex-mill yarn prices. This fueled speculation. Stocks were already low, and matters were not helped in that procurement and shipping difficulties reduced cotton deliveries in 1976/7 by 12% on last year. To compound matters further, import volume of both yarn and cotton were also relatively low [4, Table A2.2]. There was just not enough yarn to go round. The unduly low stocks therefore were both the cause and effect of the excess demand situation that built up right from the beginning of 1976/7.

Of greater relevance to the subsequent analysis, of course, is the fact that, while weighted average ex-mill price in 1976/7 rose by 27.8% over 1975/6, prices at the users' and rose disproportionately. The cols. (8)-(10) show that the percentage differential between ex-mill price per lb and the like price paid by the weaver rose from 26% in 1975/6 to an appalling 62% in 1976/7.[7] As a result, possible scarcity premium on 40s count, which was 2.7% in 1975/6, rose to 31.7% in 1976/7.[8] It is notable that an unspecifiable but doubtless significant proportion of the increase in the proportionate spread between ex-mill and user-end price is due to a *de facto* "scarcity tax" privately appropriated by senior mill management (for details, see [4, pp. 230-2]). Yarn costs rose by about 40% for the handloom industry in 1976/7 relative to 1975/6. Given that yarn costs take about two-thirds of the total costs

6 This paragraph liberally draws on the author's thesis [4, pp. 74-76].

7 The author has presented elsewhere the evidence on the movements in the user-end average price of yarn [5, Table VII].

8 For what is meant by scarcity premium on yarn in the context of 1975/6 and 1976/7 in the sample handloom firm, and a treatment of how it was measured, see [4, ch. 5, and 5].

of producing cloth, unit cloth costs in 1976/7 have perhaps been higher by 28-30% relative to 1975/6. As we have seen, average product prices could only be raised by about 18%, so that the profit margin, which cannot typically be assumed to be very high given the relative ease of entry into the market, has to accommodate the remainder. It is therefore quite safe to say that weaving profits, on average, have been much lower in 1976/7 than in 1975/6. Since a preponderant majority of the weavers see weaving as their major occupation [4, ch. 4], weaving profits presumably are the dominant component in their incomes, which implies that weavers, typically, were subject to a serious decline in the levels of incomes, all sources counted. It is natural that individuals will sell assets and items of wealth to bridge gaps in liquidity. Before, however, we turn to examine the levels and determinants of the wealth flows, a comment on the nature of the force (s) which trigger (s) such transactions in the present connection is worthwhile.

We cannot attribute the incomes-depression to the fact of reduced cotton and yarn imports of 1976/7, though they contributed a minor part. Nor can we blame it on a sudden intensification of the weavers' exploitation by the merchants because, as we have argued elsewhere [4, ch. 5], the latter have offest the weavers' price disadvantages with liberal (yarn) quantity accommodation and because only a strict minority of the weavers regard mercantile exploitation as their cheif constraint on viability. This is not to imply that merchants did not, in part, benefit from the existence of scarcity premia. Far from it. For, it is quite clear, and borne out by contemporary informed opinion [3, pp. 23-4], that the senior mill management together with the wholesalers and, to a smaller extent, retailers appropriated to themselves the scarcity premia which must be regarded as a highly inequitable income transfer from the weavers whose lack of occupational manoeuvrability welds them into the vicissitudes of weaving. This brings us to what we think has in reality caused the income depression under focus.

The cause, we believe, lies inside the economic weaknesses of the exploited agents which constrain their choices such that they fail to dissociate themselves from the consequences, even if foreseen, of external disturbances or institutional failures. We purposely speak of institutional failures because no doubt the mismatch between unit BTMC yarn costs and BTMC ex-mill prices in 1976/6, which fueled speculation, reflected none other than an institutional failure to create price signals in order to arrive a more 'efficient' intertemporal (i.e., between 1975/6 and 1976/7) allocation of yarn. However, it would be wrong to single out this institutional failure, or even the existence of agents (e.g., the mill management) who privately appropriate scarcity premia as the causes of the weaver's income depression. The cause has to do with the fact that the hand-weavers' endowment restrictions well-nigh preclude employment mobility in the face of effective or anticipated decline in incomes. Unless the asset structure is somehow made more equalised, external disturbances will always produce crops of victims of deprivation and wealth polarisation. To the nature and determinants of which, we may now turn.

IV. FINDINGS AND DISCUSSIONS

Our findings are arranged as follows. We look, first, at whether 1976/7 1975/6 displays any marked change in (a) the sheer number of transactions, whether as sellers or buyers, (b) the total and composition of wealth items transacted, (c) the unit transaction value (combining the effect of unit price of wealth-item and the absolute physical quantities concerned), and (d) the unit price of wealth items. We find for example that, while unit price of wealth in 1976/7 declines relative to 1975/6 for the sample, all three variables noted in (a), (b) and (c) above have risen in 1976/7. Why does unit transaction value of purchase increase very substantially in a year on a sample with an acute squeeze on the mean total incomes ? An explanatory framework is formulated to rationalise this paradox, and then tested in terms of a regression model. With this structure, we now turn the examination of the specific findings of the paper.

Table II presents the number of transactions in wealth in 1975/6 and 1976/7.

In both years, there has been a not inconsiderable number of such exchanges. Taking the ratio of the number of transactions to the number of respondents in each size class category of the handloom units as a gross measure of wealth market involvement,[9] we find that for the two handloom areas it averages at 25.4 % and 35 % in 1975/6 and 1976/7 respectively. This is an aggregative view however, perhaps obscuring the relationship between the nature of the exchanges and the size of the transacting handloom units. Thus for instance when we look at the ratio of purchases to the size-class number of respondents, and compare these with the matched ratios of selling transactions in both years, but particularly in 1976/7, smaller handloom units are seen as more heavily involved in the market as sellers, and conversely for larger handlooms. This measure of involvement does not tell us anything about the average transaction values.

Table III shows the levels and structure of the wealth transactions in the two years. As for levels, we have presented mean level of purchase and sale in both absolute and per-person terms, as also per-capita purchase and sale relative to income per weaving household. However, in the absence of total household income, we have compared if with per capita GDP. We find, first, that smaller handloom entrepreneurs have considerably greater proportionate shortfall relative to large ones as buyers of wealth items, than for sellers. For example, in 1975/76 the purchase per capita of the large units of Tk. 1688 exceeds the matched figure for the smaller size-class by a factor of more than 8 , while the corresponding factor for sales is just over 2. In 1976/7, the multiple in favour of the 15+ class in purchase is somewhat lower

[9]These are gross in the further sense that in a few cases one respondent was responsible for more than one transaction.

TABLE II

NUMBER OF TRANSACTIONS IN PERSONAL WEALTH OF THE SAMPLE OF HANDLOOM WEAVERS, 1975/6, 1976/7

(Number)

Particulars	Size Classes (looms)				All	
	1-14		15+			
	1975/6	1976/7	1975/6	1976/7	1975/6	1976/7
1	2	3	4	5	6	7
(A) Purchase						
1. Land	2.7	3.6	3.7	4.1	2.8	3.7
2. Homestead	0.3	0.7	—	1.0	0.3	0.7
3. Loom	2.7	2.3	2.4	3.0	2.6	2.4
4. Cattle	1.6	3.6	2.4	3.4	1.7	3.6
5. Others	0.3	0.3	1.6	1.6	0.5	0.5
6. Total	7.6	10.6	10.1	13.1	7.9	11.0
(B) Sale						
1. Land	1.0	5.0	1.0	0.6	1.0	4.5
2. Homestead	0.6	1.3	—	0.6	0.6	1.2
3. Loom	2.0	4.0	0.4	—	1.8	3.5
4. Cattle	4.0	5.3	1.4	1.4	3.6	4.8
5. Others	3.3	1.3	3.3	2.0	3.3	1·4
6. Total	11.0	17.0	6.0	4.6	10.4	15.5
(C) Ratio of No. of Deals to No. of Respondents						
1. Purchase	8.4	11.7	39.3	51.0	12.2	16.6
2. Sales	11.8	18.9	23·1	17.6	13.2	18.8
3. All	20.2	30.6	62.4	68.6	25.4	35.3

Source : Sample survey data.

TABLE III

THE LEVELS AND STRUCTURE OF THE TRANSACTIONS IN WEALTH OF THE SAMPLE OF HANDLOOM WEAVERS, 1975/6, 1976/7

(Unless specified else, percentages)

Particulars	Sizes Classes (Looms)					
	1-14		15*		All	
	1975/6	1976/7	1975/6	1976/7	1975/6	1976/7
1	2	3	4	5	6	7
(A) **Purchase**						
1. Land	57.8	71.7	79.4	72.8	60.4	71.8
2. Homestead	7.2	5.4	0.0	6.6	6.3	5.5
3. Looms	19.5	7.4	7.0	6.6	17.9	7.3
4. Cattle	13.0	12.0	8.0	8.5	12.4	11.6
5. All others	2.4	3.4	5.6	5.1	2.8	3.6
6. Total (Taka 000s)	17.5	49.6	43.6	77.5	20.7	53.0
7. Purchase/respondent (Tk.)	189	554	1688	3054	373	861
8. Row 7 as % of GDP per capita, Bangladesh	15	45	133	250	29	70
(B) **Sale**						
1 Land	18.3	63.0	40.0	24.0	20.9	58 2
2. Homestead	11.2	11.9	0.0	16.4	9.8	12.4
3. Looms	18.0	7.8	3.1	0.0	16.2	6.8
4. Cattle	28.9	13.1	24.7	27.2	28.4	14.8
5. All others	23.5	4.2	32.2	32.3	24.6	7.6
6. Total (Tk. 000s)	17.6	63.2	10.6	15.5	16.8	57.4
7. Sale/respondent (Tk.)	188	703	405	570	215	686
8. Row 7 as % of GDP per capita, Bangladesh	15	58	32	47	17	57

Note: In each panel, figures in rows 1-5 are percentages.

Sources : Sample survey data.

than in 1975/6 but still a hefty 5.8, while the per capita sale of the 15+ class is lower by about one-third than the figure for the 1-14 class.

One immediate upshot is that for any given distribution of purchases or sales within the size-classes, the distribution of wealth in the sample as a whole has, over the two years, become progressively more unequal. This follows from the fact that the agents in the 15+ units—a manifest minority—have a very large excess of their mean purchase over and above their mean sales, while the preponderant majority of the sample, i.e., those associated with 1-14 loom size-class, have, in 1976/7, decumulated wealth (as is shown by the considerable increase of mean sales over purchase). The second major finding of the table has to do with the structure of transactions. Before going any further, note that, while land, cattle and looms are specimens of productive wealth, and homestead indicates an essential wealth, the entry "all others" captures deals in jewellery, consumer durables and the like. In other words, productive and essential items of wealth can be regarded as critical to the productive potential of the agents concerned, while the residual category corresponds to what, in the social context of rural Bangladesh may be termed as mis-consumption. Using this dichotomy, the figures in row 1 through 5 of panel B of Table III throw a valuable insight into the nature of problems that agents have to face when contemplating sales of personal wealth.

First, we find that in 1975/6 23.5% of the sales by small units consisted of non-essential types of wealth. A clear majority of the sales of wealth by this class then consisted of essential items of wealth. 1975/6 being an essentially good year from the viewpoint of incomes flow, this predominance of productive wealth in sales means that the agents in this size-class do not have any significant flexibility provided by their ownership of consumer luxuries. We can conclude that for this size-class decisions to sell are weighted toward essential personal items. This conclusion applies with the greater force in 1976/7, when 96% of the sales by this class is made up of essential wealth items. Of particular significance is the fact that the sale of land takes nearly two-thirds of all sales in 1976/7 in this class, in spite of the unfavourable fact that land prices have fallen by nearly one-fifth (see below).

The situation of the large handloom entrepreneurs is quite different in that in both years about one-third of the sales are of the non-essential types, and that the share of land in sales in 1976/7 is in fact lower than in 1975/6, not least because lower land prices during the former persuaded people who had the ability to wait against selling land just then.

A major proportion of purchases consist of land. In an economy with acute scarcity of land relative to population, to find that land should be a dependable store of value is not surprising, and the always strong urge to buy land was further whetted in that, as already mentioned, the land prices fell in 1976/7, comparatively speaking.

We have seen so fai that in 1976/7 relative to 1975/6, the incidence of transactions in items of wealth has increased, especially in respect of sales of assets, and further that per capita sales and purchases have both risen (sales again more than purchases). We still do not know aynything about unit value of transactions in various classes of wealth. Unit transaction values are desirable in themselves, in that a large-sum distress sale (or opportunistic purchase) derives from a qualitatively different situation in terms of the desperation of the personal exigency in the case of a distress sale, and of a favourable personal liquidity endowment in the case of an opportunistic purchase.[10] As such, Table IV presents the evidence concerning unit transaction values in the two years studied. The main findings of the table is that in nearly every case presented, the unit transaction value in 1976/7 is higher than in 1975/6, the increase in question being anything between 14% to 149% depending on the size-class.

TABLE IV

VALUE PER TRANSACTION ON DIFFERENT WEALTH ITEMS, 1975/6, 1976/7

(All figures are Tk.)

Value/Transaction	Size Classes (loom) 1—14		15+		All	
	1975/6	1976/7	1975/6	1976/7	1975/6	1976/7
(A) **Purchase**						
1. Land	3811	9774	9727	14179	4537	10315
2. Homestead	1025	1367	—	5409	899	1863
3. Loom	1296	1635	1350	1610	1303	1632
4. Cattle	1418	1868	1488	1916	1427	1874
5. All others	342	1709	1468	1773	480	1717
(B) **Sales**						
1. Land	3083	7976	4273	5151	3229	7629
2. Homestead	2238	5885	—	5409	1963	5827
3. Loom	1530	1224	302	—	1379	1074
4. Cattle	1351	1555	3355	2227	1597	1637
5. All others	1220	2032	1038	2141	1198	2045
6. All items	1597	3721	1726	3205	1613	3658

Sources : Sample survey data.

[10]This was just in the way of illustration. It is of course true that an act of sale may proceed, not so much from distress conditions, as from an optimising action to change one's portfolio of wealth. We shall not try to escape the realistic notion that an unspecified proportions of the sale considered here are results of portfolio optimisation. However, we believe, given the drastic depression in weaving incomes, that a major proportion of the sales represent a painful adjustment to improve the immediate cash flow situation.

What has to be explained here is not so much why the number of transactions per respondent goes up in 1976/7 as why the average magnitude also goes up and more important, why both unit sales and purchase values are found to rise in 1976/7 relative to 1975/6. Now it is not very surprising that in a year of reduced cash flow the value of a typical asset sold may rise relative to better times. However, the fact that the value of a typical asset bought rises too in such a period means that there are actors who can still push through purchases of the relatively high valued assets that are on offer. The reason may inhere, in part, in the prices of assets prevailing in the two years, and so it becomes important to examine the pattern of prices of wealth items in the two years (Table V). It is quite clear, despite the uncertainties noted in the succeeding footnote, that prices of the three assets (land, cattle and looms) in 1976/7 are significantly lower than in 1975/6.[11] A consideration of the figures in the parentheses of cols. 6 and 7 suggests that

TABLE V

UNIT PRICE OF SPECIFIC TYPES OF WEALTH ITEMS

	Size Classes					
	1-14		15+		All	
	1975/6	1976/7	1975/6	1976/7	1975/6	1976/7
(A) **Purchase**						
1. Land/acre	34186	29370	34771	28485	34258	29261
	(100)	(86)	(100)	(82)	(100)	(85)
2. Loom/unit	806	617	765	604	800	615
	(100)	(76)	(100)	(79)	(100)	(77)
3. Cattle/unit	1418	1151	1488	1079	1427	1142
	(100)	(82)	(100)	(72)	(100)	(80)
(B) **Sale**						
1. Land/acre	34253	27714	37424	29491	34642	27932
	(100)	(81)	(100)	(79)	(100)	(81)
2. Loom/unit	748	590	830	—	758	590
	(100)	(79)			(100)	(79)
3. Cattle/unit	1351	1105	1809	1368	1407	1137
	(100)	(82)	(100)	(76)	(100)	(81)

Notes : Figures in parentheses represent the 1976/7 figures as % of the matched 1975/6 figures.

Sources : Sample survey data.

11Admittedly, estimates of unit price of assets can have wide variations on account of quality age differences. However, a case can be made, especially as regards land which in both years is found to account for the largest share of purchases—that the errors are unlikely to be very large. Both areas were relatively homogeneous plain land, with presumably shall intra-area variability in land-quality. The main argument does not decisively rely on this analysis about prices, howeve,r

the rate of price depression on sales has been rather more uniform than the like rate of decline on purchases, where the decline has been anything from 23% for looms to 15% for land. At any rate, it can be said that in 1976/7 prices realised by all three classes of wealth, whether sold or bought, have been lower.

We then have on our hands a paradox of why in a year of reduced mean incomes, would our sample of handloom entrepreneurs, on average, accelerate their rate of purchase, especially land and cattle, as well as the unit transaction value on such purchase. It stands to reason, of course, that in times of income-depression, the rate, and the unit transaction value, of sales may accelerate, but the question is why the same may be true of purchase as well. It is argued in the rest of this paper that this is a matter of advantageous wealth consolidation by a minority group of resourceful agents at a time of relatively attractive prices, the consolidation in question possibly arising from speculative considerations, and further that the resources implied are (a) favourable institutional credit connection and (b) informational access. As attempt has been made to show this in terms of a regression exercise however, before going any further, we may examine the logical adequacy of at least two alternative explanations for this finding.

First, we must consider the thesis that the above figures on raised 1976/7 values for unit transactions on sales and purchases reflect optimising portfolio adjustments, whereby the same individual is getting rid, say, of an inferior-quality land at an apparent price-discount and getting hold of better quality land, now available, in 1976/7, at a genuine discount. It is of course arguable that a certain proportion of the sales and purchases is attributable to the same set of agents balancing off decumulations with accumulations. However, a closer examination of data showed this argument to be untenable. We found for example that in none of the cases examined did the same agent purchase any asset in the same year that he was also involved in selling. In a negligible small proportion (8%) of cases, it did happen that an agent purchased and sold in the same year what were different items. However, given the quantitative insignificance of such dual transactions, this line of explanation does not substantively illuminate the problem posed.

Second, one may say that there may always exist agents with high enough incomes to be able to capitalise on an opportunity for advantageous wealth consolidation. This line of reasoning may invoke (unequal) distributional considerations to a rationalisation. True, in 1976/7, mean incomes from weaving were depressed. Such incomes could, however, one could further say, also have been unequally distributed. At any rate, one has to concern oneself with total incomes of agents, and with how equally they are distributed. It is probable that, despite income depression on the whole, there still are well-off agents to muster liquidity enough to cash in on. In other words, this line of agrgument posits that liquidity is evenly

distributed in a small pocket of the well-off in a dismal world of depressed incomes. This is the hypothesis we reject in favour of the one which functionally relates efficacious liquidity to the link to the institutional credit market. It suffices here to say that, in so far as liquidity implies the capacity to raise cash at short of notice, a high per capita income need not automatically bestow such a capacity, there may for instance, be other claims on those incomes. However, being a credit client of the commercial banks is a more dependable guarantee for access to liquidity. We have found later that institutional credit accommodation explains net wealth accumulation better than incomes variables. To this, we may now turn.

The Suggested Explanation

Consider the following line of reasoning, intended to help establish a set of causal determinants of net wealth accumulations. In 1976/7, there occurs, due to unfavourable incomes situation for most weavers, an increase in the number of offerings for, as also an increase in the unit value of, assets to be sold. Now in a period of downturn in trade value and earnings, not everyone has the liquidity to step in as potential buyers for assets of large unit values. In contrast, people with liquid money will perfectly well understand that buying at such times can lead to lucrative bargains because sellers do not have much staying power. As such, they may well be on the lookout for such opportunities.

This subjective element already raises the probability of their realising such opportunities when they arise. The probability is even higher if these agents hapen to be in an occupation where there is a particularly close communication with the potential sellers, mostly smaller weavers. In other words, preferential access to liquidity in terms of linkage to institutional credit and a close familiarity with the weaknesses of the potential sellers can be hypothesised as causally influencing the levels and terms of net purchases. Now this explanation hinges on the existence of actors with the expectation and the means to make capital gains from unequal exchanges. These expectations are likely to lead to concrete actions only in periods of relative deprivation among the operators historically associated with net selling of wealth. This would mean that such expectations are unlikely to be important in periods when the general economic outlook is better.

If this hypothesis is to be accepted as a basis for explaining the facts, we expect net purchases in 1976/7 to be functions of one or more of (i) institutional borrowing power, (ii) possession of yarn/other trading out-lets (which widens one's orbit of information and increases one's bargaining ability), and (iii) age of the buying enterprise. At the same time we shall expect these attributes to be (statistically) unrelated with the sales that occur. Again, we expect purchases in 1975/6 to be relatively less affected by these explanatory variables since in our view that year was not so unfavourable for the weavers as 1976/7. However, we should not entirely rule out

the influence of the borrowing power on the purchasing decisions even in 1975/6. With these predictions we may now go to examine the relationships between the scale of net purchase and sale on the one hand and the "status" variables on the other.

Table VI presents the correlation matrix of the variables used so as to isolate variables that merit inclusion in the regression.

In view of the above coefficients, we have included only X_1, X_2, and X_3 at one time in multiple regression because total income (X_5) and X_4 tend to be highly correlated with the other three variables. Three sets of regressands were used, namely (i) gross purchase, (ii) gross sales, and (iii) net purchase (i.e., purchase net of sales). Within each set, moreover, three separate regressands were used, i.e., (a) purchase/sale of land/homestead ; (b) purchase/sale of other assets ; (c) total purchase/sale. Since land and homestead involve greater unit value in both years, it may be interesting to introduce them separately in the regression. But we also wished to see the aggregate relationship, so that it is necessary to look at the explanation of total purchase or sale as well. Ordinary least-squares equations were estimated, and the findings are set out in Table VII through IX for 1976/7 and 1975/6, respectively.

The results are sensible in terms of the hypothesis proposed above. Considering that we are dealing with only three dichotomous independent variables it is rather reassuring to find that the fits are fairly good, especially when the regressand is total purchase, whether in gross or net terms, the coefficients being consistently highly significant. Before making some area-specific comments on the nature of relationships found, a brief interpretation of the regression coefficients estimated may be in order. Since all independent variables are dummies, a positive coefficient means that the occurance of the event represented by the unitary value of the dummy variable raises the expected value of the regressand. To take the equation No. 1 in Table VII for a concrete example, regressing gross purchase of land/homestead, we find that the coefficients on X_2 and X_3 are both positive and highly significant. What this means that accommodation by the bank and the ownership of yarn retailing trade increases the purchase of these type of assets relative to the actors who do not have either the bank connection or similar commercial prominence. Similarly, a negative coefficient on these independent variables means that relative to those without the bank-connection or the ownership of trades, the respondents with these favourable connections have a lower tendency to sell assets in a freak year.

We may now make a few area-specific observations about the nature of the relationship obtained. In Narsingdi, institutional connection appears to be more important than the ownership of non-weaving trading interests, and this is visible in both (broad) types of markets examined. It is notable how the explanatory power

TABLE VI

CORRELATION MATRIX FOR THE RELEVANT VARIABLES, 1976/7

Variables	Locations									
	Narsingdi					Shazadpur				
	X_1	X_2	X_3	X_4	X_5	X_1	X_2	X_3	X_4	X_5
X_1	1.00					1.00				
X_2	0.05	1.00				0.20	1.00			
X_3	0.10	0.19	1.00			-0.03	0.24	1.00		
X_4	0.05	0.39	0.42	1.00		0.32	0.23	0.28	1.00	
X_5	0.18	0.60	0.36	0.62	1.00	0.15	0.31	0.40	0.47	1.00

Notes : The correlation coefficients are calculated for 1976/7 only, as all required data for 1975/6 were not to hand. X_1 stands for age of the respondent, X_2 for a dummy variable indicating whether respondent owns an yarn-trading outlet, X_3 for a second dummy variable indicating whether he had received any advances f.om institutional credit sources in 1976/7, X_4 for a third dummy variable indicating whether the enterprise belongs to the larger size-class, and X_5 for the total income of the respondent from all sources. The dummy variables are evaluated in the usual (i.e., either 1 or 0) way.

Source : Data from the Sample surveys.

TABLE VII

REGRESSION RESULTS FOR NARSINGDI, 1976/7

Sl. No.	Regressands	Intercept		Coefficients on X_2		X_3	No. of Cases	R^2	D-W Statistic
1.	Gross purchase : land/homestead	-187.3	+	3806.4 (6.7)	+	8356.6 (8.5)	113	0.56	2.12
2.	Gross purchase : other assets	63.7	+	522.2 (3.9)	+	971.8 (4.2)	113	0.26	2.10
3.	Gross purchase : all assets	-123.6	+	4328.6 (8.4)	+	9328.5 (10.4)	113	0.66	2.15
4.	Gross sales : land/homestead	587.8	—	380.0	—	398.8	113	0.01	—
5.	Gross sales : other assets	400.3	—	369.5	—	215.5	113	0.01	—
6.	Gross sales : all assets	187.5	—	10.5 (...)	—	182.2 (...)	113	0.01	—
7.	Net purchase : land/homestead	-587.6	+	4175.9 (5.92)	+	8572.2 (7.0)	113	0.48	2.12
8.	Net purchase : other assets	-123.7	+	532.7 (2.90)	+	1154.0 (3.62)	113	0.18	2.01
9.	Net purchase : all assets	-711.3	+	4708.5 (6/94)	+	9726.0 (8.26)	113	0.56	2.14

Notes : (a) The coefficient of X_1 is everywhere insignificant, and thus omitted. The symbol (...) appears where t-statistics is less than unit. All other coefficients appearing in the table are highly significant.

TABLE VIII

REGRESSION RESULTS FOR SHAZADPUR, 1976/7

Sl. No.	Regressands	Intercept	Coefficients on X_2	Coefficients on X_3	No. of Cases	R^2	D-W Statistic
1.	Gross purchase : land/homestead	-165.1	+ 4237.0 (4.0)	+ 2451.0 (2.24)	59	0.30	2.07
2.	Gross purchase : other assets	90.2	+ 979.5 (4.45)	+ 73.4 (...)	59	0.26	1.97
3.	Gross purchase : all assets	-74.9	+ 5216.7 (5.5)	+ 2524.7 (2.54)	59	0.43	2.09
4.	Gross sales : land/homestead	350.5	+ 868.2 (...)	+ 1019.3 (...)	59	0.03	—
5.	Gross sales : other assets	350.5	— 267.0 (...)	— 250.4 (...)	59	0.01	—
6.	Gross sales : all assets	1044.2	+ 601.2 (...)	— 1270.0 (...)	59	0.01	—
7.	Net purchase : land/homestead	-858.9	+ 3369.0 (2.4)	+ 3471.0 (2.36)	59	0.18	1.98
8.	Net purchase : other assets	-260.0	+ 1246.5 (3.49)	+ 328.8 (...)	59	0.18	2.07
9.	Net purchase : all assets	-119.0	+ 4615.2 (3.46)	+ 3794.4 (2.71)	59	0.29	2.10

Notes : The coefficient on X_1 is nowhere significant, and thus omitted. The symbol (...) appears where the t-statistics is less than unity. All other coefficients on X_2 are everywhere significant. Most of the coefficients on X_3 are likewise significant also.

Source : Data from the Sample surveys.

of the hypothesis declines when purchase of looms, cattle and other miscellaneous items are regressed : this is not surprising in that these assets are of smuch lower unit values than eigher land or homestead. These markets are more de-centralised. Consequently, the magnitude of their purchase is unlikely to be systematically related to credit privilege since the bank's preference is for relatively large loan-sizes only. Hence the explanatory power improves when purchase of land or homestead is regressed, as it calls for liquidity *per se*. Again, the selling actions of the respondents in 1976/7, have the expected pattern in that entrepreneurs with favourable institutional and commercial status sell less than those less so endowed : however, the difference is not significant.

In Shazadpur, the first thing to note is that R^2 falls quite considerably. This should caution us not to jump to any attempt to generalise : after all, our data are only rough, and we have probably excluded several other plausible independent variables (e.g., risk-preferences, rate of return from alternative assets, the age-structure and quality of the assets etc.) on the ground of data availability. Even so, there is close similarity between the two locations in the nature of the overall relationship estimated.

In general, 1976/7 data render the hypothesis plausible that it is the preferential access to institutional credit channels together with superior informational access that explain a good deal of net purchase of assets in that year.[12]

But what about 1975/6 ? Table IX shows that the explanatory framework developed earlier is less satisfactory this time. The R^2 is much lower, the effect of the commercial status is virtually non-existing. However, the institutional credit access is still found to be a significant influence upon accumulation of assets. Now, the finding that the explanatory framework poorly explains 1975/6 situation is quite consistent with our own *a priori* prediction. This ought to perhaps strengthen our conviction in the effectiveness of the causative line of reasoning underliming this paper.

[12]In other versions, we examined the nature of the fit when at least one independent variable was not dichotomous. To this end, we used total income with either X_2 or X_3. In these equation the coefficient on income was found to be generally significant and the fit was acceptable. However, the present specification produced the best results. Since income on the one hand and institutional connection and commercial establishment have already been found to be positively associated, such a finding may not be unexpected. The question remains nonetheless why the inclusion of two dummy variables, to the exclusion of income, explains the situation better than does income along with either dummy. At some risk of stretching our data, we may offer the following answer. Persons who own yarn outlets and/or is favourably accessed to the financial institutions are likely to have high total income in any case. But they are also likely to have important positional advantages which another high-income indiv.dual may not have. Thus for instance yarn trade provides them with otherwise confidential information of their clientele. Access to the institutions provide them with large sums at one time, thus raising their bargaining weight relative to the other transactors.

TABLE IX

REGRESSION EQUATION ESTIMATED FOR 1975/6 IN THE TWO AREAS

Sl. No.	Regressands (Tk. 000s)	Intercept	Coefficients on X_2	Coefficients on X_3	No. of Cases	R^2	D-W Statistic
		(NARSINGDI)					
1.	Gross purchase : land/homestead	-4.9	+ 417.5 (...)	+ 1683.2 (...)	113	0.15	2.00
2.	Gross purchase others	71.8	+ 33.7 (...)	+ 328.0 (2.06)	113	0.15	1.92
3.	Gross purchase all assets	66.9	+ 451.2 (...)	+ 2011.2 (3.19)	113	0.16	2.17
		(SHAZADPUR)					
1.	Gross purchase land/homestead	27.3	— 208.2 (...)	+ 1482.2 (2.06)	59	0.04	2.12
2.	Gross purchase other assets	18.1	+ 462.3 (3.25)	+ 152.1 (1.29)	59	0.18	2.27
3.	Gross purchase all assets	45.5	+ 254.1 (...)	+ 1634.3 (2.29)	59	0.07	2.25

Notes : (...) means t statistics less than unity.

Source : Sample survey data

On an overall basis, it may be said that the quality of the explanation of the accumulation of wealth among the handloom entrepreneurs in the industry is better in 1976/7 than in 1975/6. The main reason for this perhaps lies in the fact that the market for assets in 1975/6 was relatively open as a result of low unit value of assets offered. Probably, the more resourceful and the opportunistic operators were not in the market to the same degree. Probably, therefore, a stream of small capital sums flowed into the market for wealth items from many diverse sources. The scope for the operation of monopsonistic forces was relatively limited. In contrast, however, the reduced cashflow situation of 1976/7 served to increase the offering of relatively large unit-value items of wealth. This helped the release of monopsonistic forces into the markets for these items. Operators with disproportional borrowing and informational power in such circumstances have the ability to dictate prices which involve what may be called 'forced commercialisation'. Prices of assets were thus found to decline.

V. CONCLUSIONS AND IMPLICATIONS

In explaining the causes of the pattern of net accumulation of wealth in rural parts of Bangladesh, one may feel tempted, in the absence of virtually any credible information, to argue that high-income agents consolidate their wealth situation by acquiring on a net basis. This has been the point of departure for this paper. In the nature of a case study focusing on a sample of handloom weavers in Bangladesh, the paper argues that, where sale of asset is often motivated by liquidity contingencies and where high income need not accurately reflect relative access to liquidity, it is not high incomes as such which is nearly so important a determinant of the level of net wealth accumulation as (a) assured accommodation by institutional credit system, and (b) the ownership of a yarn retailing enterprise.

The following are the other main conclusions of the paper. First, the pressure toward asset decumulation, selectively affecting the smaller weavers, originated in 1976/7 as a result of a considerable depression of mean incomes. But we argued that, while certain external developments have no doubt played minor contributory part its primary causes must be searched within the weavers, own economic weaknesses constraining their choices such that they fail to dissociate themselves from the consequences, even if foreseen, of external disturbances, including public institutional failures. Second, we find a certain acceleration in the rate of both sales and purchases in 1976/7, that "per-capita" sales of asset rise disproportionately among smaller weavers, that "per-capita" purchases of asset rise disproportionally in 1976/7 among larger weavers, that land is on the whole the single most important store for value, whether to be acquired or shed. Third, we find that, while the number of transactions has risen in 1976/7, the unit price in each of three classes of assets, i.e., land, cattle and loom, has declined, so that the observed rise in the unit transac-

tion value, incorporating the combined effect of the (i) unit price and (ii) the unit physical quantity concerned, can only arguably reflect that the rise in (ii) above is more than proportionate to the fall in (i). Finally, we find that it is not high incomes as such but institutional credit connection and one's location in the informational pyramid which are the more forceful influences upon the level of net wealth accumulations within the sample.

The finding has an important cognitive implication, relating to the sources of the concentration of wealth.

It is of course known [12, ch. 2] that change in concentration has two component, one relating to random variables that cause what Prais has called the "spontaneous drift" in the size-differential of various (wealth) unit, the other to systematic forces leading to higher rates of growth of (wealth) units of large as opposed to small sizes. (The term wealth is treated parenthetically in the above reference to Prais because what he was talking about was not wealth as in the present context, although the two units of analysis (i.e., his and ours) cannot be seen as mutually far removed.) The point is that while the above dichotomy is interesting for theoretical purposes, a great deal of current focus on inequality, poverty and polarisation suggests that the role that governments have played in developing poor economies have been as pervasive as urban-biased [10], where policies and institutions have, whatever their declared intentions, been on the whole anti-poor in fact. In other words, the societal and developmental modes of behaviour have created systematic growth tendencies that favour large units above small ones, quite often at the expense of economic efficiency. In our sample, too, we have found that access to bank credit is a privilege of the large handloom weavers [4, Table 4.12], and so is the access to yarn retail outlets. There is, hence, a clear selectivity in the determination of the net wealth accumulation favouring the institutionally well-heeled agents. The tendency towards increasing concentration in wealth, then, is more properly seen as a derivative of systematic Institutional privileges given to particular agents, not of "fair chances" everyone has to either grow or decay.

We would like to end this paper by drawing an implication for further research. The difficulty with this paper is that in a way it establishes the obvious, i.e., that not all the rich can take advantages of opportunities to get richer, but only those that actively try to, in particular by occupying critical points in the trade-credit-information network. What may have made the paper more interesting was an attempt perhaps to explain why all the rich in fact do not do this. Is this because (a) they lack the drive and motivation, (b) there are other claims on their income (many dependants, etc.) or (c) they have other channels for investing their surplus not captured in the paper.[13] Now, to be able to answer these and other questions would seem to

[13]The anthor is grateful to Mr. A. Abdullah whose words are quoted liberally in this paragraph, who first pointed out these shortcomings.

call for a survey that focussed, not so much upon what determines net purchase of assets, as upon what makes the agents who purchase on a net basis, in fact, do so. In other words, while this paper is a causative explanation of asset acquisition, the causation highlighted relates to proximate variables, not vultinate ones. Future researches in this area would be well-advised to take this aspect of our paper above in view.

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Marginalisation Vs. Dynamism: A Study of the Informal Sector in Dhaka City

by

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The paper examines the labour force of the informal sector in Dhaka with respect to earnings, ability to save and invest, and attitudes and motivations. The findings indicate that involvement in informal activities is perceived as a means of altering the personal fortunes of people from a poor economic background. This is illustrated by the overwhelming preference of those self-employed in the sector to continue in current or similar activity within the sector. That such responses are based on genuine economic considerations is supported by the data on income which compare favourably with income of comparable groups in both urban and rural areas. It is not merely the current level of income that offers hope to the participants ; prospects for the future also are perceived as good. This does not seem to be delusionary since there is evidence of occupational mobility within the sector. Overall, our results confirm that informal activities may be classified into two distinct groups : (1) those which lead to some accumulation of capital and (2) those leading only to a marginal living. The latter group comprises of about one-quarter of the self-employed and more than one- third of the employees. In contrast, upwards of one-third of the self-employed show significant economic potential. In general, the informal sector opens up some ways for self-improvement and breaking out of poverty to the disadvantaged of the urban labour force.

I. INTRODUCTION

Development experience of the last two decades or so has offered several lessons to low income countries. The principal one seems to be that these countries must strive for a development strategy that could ensure : (1) absorption of more labour to keep pace with an increase in labour force, (2) more equitable distribution of gains from development and growth, (3) adoption of technology that is appropriate to resource availability, (4) development of human resources through the spread of

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basic skills, and (5) provision of basic needs for all people (Haq, 1976 and Singer, 1977). As the practicability of such a development strategy was being explored, the informal sector started to draw greater attention from international agencies, national policy makers, and academics of several related disciplines. The initial work was almost exclusively optimistic (ILO, 1972; and Weeks, 1975), founded on the sector's perceived potential role in realizing the newly formulated priorities in development. However, it did not take long for a more critical examination to appear, which ranged from outright rejection (Leys, 1973 ; and Gerry, 1979) to cautious optimism (Rempel and House, 1977 and Tokman, 1978).

To put the respective views briefly in a testable form, first, the optimistic view may be portrayed as hypothesizing: (1) the informal sector adopts technology on the basis of factor availability ; (2) hence, the informal sector generates more employment than would the formal sector ; (3) hence, the informal sector contributes to a more equitable distribution of income ; and (4) the informal sector can accomplish all of the above without sacrificing the level of output.

On the other hand, pessimists reject any development potential in the informal sector. Their argument is based on a global view of the international capitalist system. In this view, because of its dominant position, the 'metropolis' of the system, working through the multi-national corporations, dictates what goods are to be produced, what technology is to be used, what level of capital accumulation is to take place, and the extent of indigenous capitalism to be allowed to grow in the peripheral area of this global system (Bienefeld, 1975). Although these arguments may have their own merits with respect to formal sector industries in low income countries, it is likely that these will have limited validity in the specific case of informal sector business and production. At any rate, these arguments and their implications for the informal sector cannot be determined unless they are put in a testable form. For this purpose, the pessimistic views on the informal sector may be portrayed to be hypothesizing :(1) the informal sector is dependent on the formal sector as well as on imported materials for its supply needs, (2) the informal sector is also dependent on the formal sector for marketing its output, (3) hence, its ability to accumulate capital is severely limited, (4) as a consequence, proletárianization, rather than a transition towards the growth of small indigenous capitalism, is the major feature of the informal sector.

Still others argue that the informal sector essentially consists of two groups : one group is variously called 'community of the poor', 'individual-enterprise sector', 'irregular sector', 'dependent workers', or 'lumpen-proletariat' ; the other group is described by different writers as 'intermediate sector', 'family-enterprise sector', 'modern informal sector', 'truly self-employed' or 'petty commodity producers'. Two alternative hypotheses are then offered in predicting the development potential of these two groups : the first group is hypothesized to have little scope to contribute

to capital accumulation and the other group is hypothesized to be the dynamic part of informal sector with an ability to contribute to capital accumulation and further growth and development.

An important empirical question is to determine the relative proportion of these two groups in the sector. It is possible that optimists are assuming that the second group is the dominant group in the informal sector, while the pessimists suppose that the first group is in the majority. This illustrates how an apparently polarised view may be reduced to a simple empirical question, the answer to which facilitates resolution of issues. Elsewhere we have attempted to assess the overall economic potential of the informal sector by addressing these opposing viewpoints on the basis of a case study of the sector in Dhaka (see Amin, 1982). The present paper set itself the task of addressing this last question, i.e., an empirical determination of the relative proportions of "marginal" and "dynamic" group of enterprises in Dhaka's informal sector.

II. DEFINITION OF THE INFORMAL SECTOR IN DHAKA

Most writers tend to define the informal sector by referring either to some employment characteristics such as the absence of coverage by minimum wage legislation, trade union organisation, and security of employment (see Peattie, 1974 ; Mazumder, 1976 ; Bromley and Gerry, 1979) or some enterprise-related characteristics such as size and ownership of the enterprises, markets in which they operate, resources they utilize, technology they adapt, and ease or difficulty of starting these enterprises (see ILO, 1972 ; Weeks, 1975 ; Sethuraman, 1976 ; Scott, 1979).[1] A listing of those characteristics, however, serves little purpose when the concern is to define the sector in a form suitable for empirical analysis. This is because most of those characteristics such as ease of entry or lack of job protection, cannot be visually verified for a particular enterprise and hence do not offer much guidance in deciding if it is to be included in a survey.[2]

It is important that identification criteria meet two requirements : first, these need to flow from a basic definition and second, they should be applicable without much prior knowledge if they are to offer guidance for identifying the enterprises of interest. With this in view, the informal sector is defined in this study first, at the conceptual level to include all enterprises which are not officially regulated and which operate outside the incentive system offered by the state and its institutions. In contrast, enterprises which enjoy official recognition, protection and

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1For a comprehensive discussion of various approaches to defining the informal sector, at the conceptual level, see (Amin, 1983).

2For discussions of problems associated with the identification of informal sector empirically see (Sethuraman, 1976 ; Mazumdar, 1977 ; Fowler, 1978 ; and Amin, 1982.)

support are defined as formal sector enterprises. No such support or protection is available to informal sector enterprises. At best, these enterprises are tolerated but the norm is to subject their operators to routine harrassment or pursue overt and covert policy with the aim to reduce or eliminate these "unauthorized economic activities" altogether.[3] At the empirical level, the informal sector in Dhaka is defined to comprise those economic enterprises which employ less than 10 persons (including the owner) per unit and which simultaneously satisfy one or more of the following conditions : (a) it operates in open premises ; (b) it is housed in a temporary or semi-permanent structure ; (c) it does not operate from spaces assigned by government, (d) it operates from residences, or back-yard ; and (e) it is not registered.[4]

III. SOURCES OF DATA

For the present purpose, our survey data[5] on (1) type, ownership, and size, (2) earnings, savings and investment, (3) attitudes and motivations, (4) length of stay in the city of the informal sector labour force are utilized. Where required and possible, the survey findings are compared with similar data for formal sector and/or total urban labour force.

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[3]Reports on harassment of hawkers, rickshaw drivers, and handcart pullers frequently appear in the newspapers and magazines. In addition, various subtle policies are directed either to restrict new entry or make these activities obsolete by a host of policy favouring "modernization". The policy towards rickshaw drivers illustrates the case : increased imports of auto rickshaws, coasters and strict enforcement of traffic laws in recent years are specifically directed against further growth of rickshaws in the city.

[4]This refers to registration under the Factories Act, the Shops and Establishments Act or professional groups' regulatory acts. This should not be confused with having a 'trade license' 'permit for hawking' or a license for driving rickshaw. These licenses are given by the City under its by-laws. An informal enterprise as defined in our study may or may not have such a license but it is certainly not registered under the Acts noted above.

[5]In selecting the sample of the survey, conducted during January to June of 1979, a stratified random sampling technique was used. The three principal stratification variables were geographical location, activity type and size, measured by number of persons employed, of the enterprise in the survey. The enterprise, sampling unit of the survey, was defined broadly to include all business operations from which some one was trying to make a living. This could either be in the form of an inpividual selling his only possession, labour power, mostly without any capital, e.g., a rickshaw driver or a construction worker : or in the form of an economic unit in which labour and capital were being combined in some type of institutional setting, no matter how rudimentary its form, e.g., a repair workshop or a tailor shop. In cases where in addition to the owner, the enterprise had workers whether unpaid family members or employed labour the unit with all its participants was considered the sampling unit. For details on survey methodology and sampling technique used (see Amin, 1982.)

Data on the informal sector labour force derive from the questionnaire responses of 790 individuals who were interviewed from the 437 enterprises sampled. Included are the owners[6] of 437 sampled units and 353 workers[7] from those enterprises. Since formal sector activities were not surveyed, comparable data on this sector were collected from secondary sources, the major one being the 1974 census reports. Where comparable census data are not available, other sources are used.

IV. TYPE OF ACTIVITIES IN THE SAMPLE

Before proceeding to the main thrust of the paper, it seems to be useful to take note of the range and diversity of activities in the informal sector. The literature on the sector recognizes this aspect[8]. Some critics, utilizing this empirical fact to launch an attack on the concept, suggest that it is analytically useless to conceive of a sector in the face of such heterogeneity (see Breman, 1976). Our results confirm the existence of a wide variety of activities in the sector. However, we do not find it futile or impossible to group them in meaningful categories for analytical convenience. Table I indicates the wide spectrum of these activities. In the initial census, 230 different types of activities were listed. Such detailed disaggregation seems to be neither necessary nor manageable in carrying out an analysis. Consequently, activities are grouped into five major categories, shown in the table.

From Table I it appears that selling clothes, food, pan-cigarettes and business in second-hand items are the dominant retail activities in informal trade.

Repairs of all kinds account for almost two-thirds of service enterprises, a clear indication of its importance in the group. Shoe-shining, one of the frequently mentioned informal activities, accounts for only nine per cent of the service group, or less than two per cent of the total sample. Tailoring (31 %) and various metal works (28 %) are the two more frequently observed activities in the sample for manufacturing. Shoe-making and other leather works account for another 13 per cent,

6Throughout the paper 'owners' means the heads of the sampled enterprises who are the owner-cum-operator of these enterprises. Some heads, 35 transport workers who do not own their vehicles and 49 construction workers, are not owners in the usual sense of ownership of means of earning, except of course their labour power. They are nonetheless treated as owners because first, like owners their income is not fixed and second, unlike workers they are not under any contracted obligations. It is to be noted that unless specified otherwise, the terms 'head', 'owner', 'self-employed' 'own-account worker' and 'operator' denote the same 437 individuals who either owned the respective enterprise or were in charge of it.

7Among the workers are included three working partners of the enterprises. Where analysis calls for strict separation between owners and workers, they are included with owners.

8See, among others, Webb (1975) ; House (1977); McGee (1979) and the ILO -City publications (e.g., Sethuraman, 1975 ; and Nihan and Jourdain, 1978).

TABLE I

PERCENTAGE DISTRIBUTION OF INFORMAL SECTOR ENTERPRISES IN THE SAMPLE BY ACTIVITY GROUP

Activity Group	Proportion of Enterprises	
	In Respective Group	In Total Sample
1. Street selling and other petty retailing :*		
(i) Clothes and garments	27.6	10.3
ii) Raw food (fruits, vegetables, fish, meat etc.)	19.6	7.3
(iii) Pan-cigarettes**	12.3	4.6
(iv) Second-hand clothes	7.4	2.7
(v) Cooked food (pavement eating and tea stalls)	7.4	2.7
(vi) Buying and selling of old/scrap items	7.4	2.7
(vii) Stationary items	5.5	2.1
(viii) Grocery items	4.3	1.6
(ix) Newspapers	1.8	0.7
(x) Others	6.7	2.5
Total	**100.0**	**37.2**
	(163)	(163)
2. Repair and other personal services : *		
(i) Shoe-repairing	13.6	2.1
(ii) Appliance repairing	13.6	2.1
(iii) Motor vehicle repairing	10.6	1.6
(iv) Pen, watch and eye glass repairing	63.6 7.6	9.7 1.1
(v) Lock and key repairing	6.1	0.9
(vi) Garments repairing	6.1	0.9
(vii) Cycle and rickshaw repairing	3.0	0.5
(viii) Other repairing	3.0	0.5
(ix) Hair cutting/barbers	10.6	1.6
(x) Shoe-polishing	9.1	1.4
(xi) Street-typist	3.0	0.5
(xii) Book binding	3.0	0.5
(xiii) Sign board writing	1.5	0.2
(xiv) Others	9.1	1.4
Total	**100.0**	**15.3**
	(66)	(66)
3. Crafts and other manufacturing :*		
(i) Tailoring	28.7	7.1
(ii). Metal works	25.9	6.4
(iii) Shoes and other leather goods	12.0	3.0
(iv) Weaving (sarees, carpets)	11.1	2.7
(v) Furniture	10.2	2.5
(vi) Bakeries	3.7	0.9
(vii) Pottery	2.8	0.7
(viii) Others	5.6	1.4
Total	**100.0**	**24.7**
	(108)	(108)
4. Construction work :*		
(i) Earth digging	40.0	4.6
(ii) Mason helpers	24.0	2.7
(iii) Brick-breaking	14.0	1.6
(iv) Carpentry	8.0	0.9
(v) Painting	6.0	0.7
(vi) Masonry	4.0	0.7
(vii) Plumbing	4.0	0.4
Total	**100.0**	**11.4**
	(50)	(50)

(*Contd.*)

TABLE I (*Contd.*)

5.	Rickshaws and other informal transport :*		
(i)	Rickshaws	50.0	5.7
(ii)	Tempos (rebuilt rejected auto-rickshaws)	20.0	2.3
(iii)	Hand carts	20.0	2.3
(iv)	Bullock carts	10.0	1.1
	Total	100.0 (50)	11.4 (50)
	Grand Total	—	100.0 (437)

*For ease of reference, the five acrivity groups are referred to in this study as Trade, Service, Manufacturing, Construction, and Transport respectively.

**'Pan' is the Bengali word for betel leaf which is chewed with betel, nuts, tobacco, etc. "Pan-cigarettes" stalls are one of the common sights of informal activities in Dhaka which sell cigarettes and a mixture of above chewing materials.

while weaving and furniture-making follow closely, with 12 per cent and 11 per cent respectively. In construction, earth digging, work as helpers to masons, and brick-breaking are found to be common. Carpentry, painting, masonry, and plumbing, the ones which require some skills, account for only 22 per cent of construction activities in the sample. Rickshaws account for half of the sample in the informal transport system.[9] Tempos, push carts, and bullock carts, together account for the other half. 'Tempos' or 'helicopter service', as they are sometimes called, is a passenger shuttle service connecting important city points and is provided by almost discarded vehicles rebuilt for the purpose. Riding in Tempos carries with it an element of risk but still has grown in recent years because it is cheaper than rickshaw or auto-rickshaw services and takes less time than what is required by rickshaws. Push cart and bullock cart are informal alternatives to modern truck service.

V. OWNERSHIP AND SIZE OF ENTERPRISES

In addition to a knowledge of the nature and type of such activities, an awareness of ownership patterns of informal enterprises and their size is essential to understand the scope for individual initiatives. The distribution of ownership of the surveyed enerprises is shown in Table II. As expected, single ownership, mostly by the producer himself, is found to be almost universal for enterprises in trade, service and manufacturing. For construction, given the fact that most of them are construction labour, ownership is not relevant. In transport, only 28 per cent own the vehicle that they drive, 14 per cent are partly owned and the remaining 58 per cent belong to absentee owners. In the latter cases, drivers rent vehicles from owners on a daily basis and pay a fixed rent at the end of a day's work. Overall, only a few cases of joint ventures (4 %) and less than 8 per cent absentee ownership are observed

9 The sample of transport was selected on a quota basis. Thus the distribution of different types of transport may not accurately reflect the 'population' distribution of these activities.

in the total sample. Thus with the exception of transport, single proprietorship is the general rule of organizing an informal operation.

Because of single ownership, these enterprises are likely to have a considerable degree of independence in their day-to-day operation.[10] But it also implies little division of labour and little specialization within the work process (Scott, 1979 : 109). More importanly, single ownership can impose effective constraint on size, expansion, and improvement of an enterprise depending on the individual's ability to raise required capital. Also, the stake becomes much higher if a loss or debt occurs in such an enterprise. From this one may hypothesize prevalence of single ownership, among others, as an explanatory factor of some of the well-known informal sector characteristics such as lack of capital and miniscule operation.

TABLE II

PERCENTAGE DISTRIBUTION OF INFORMAL SECTOR ENTERPRISES BY TYPE OF OWNERSHIP AND BY ACTIVITY GROUP

Type of Ownership	Activity Group					Total Sample
	Trade	Service	Manufacturing	Construction	Transport	
Single-Owner	98.2	93.9	99.1	n.a.	28.0	88.6
Partner-ship	1.8	6.1	0.9	n.a.	14.0	3.9
Absentee	—	—	—	—	58.0	7.5

Whether it is measured by number of persons engaged or capital employed, the miniscule size of the informal sector is confirmed by our survey data. As Table III shows, 58 per cent of the total sample are one-person economic unit. This proportion rises to 65 per cent for trade activities. Compared to this, only about 22 per cent of the total sample employ three or more persons, including the owner, per enterprise. Manufacturing accounts for the bulk of this small group of relatively larger enterprises. Indeed about two-thirds of them employ three persons or more. All other activities are either one-or two-person operation. The second person often is either a helper or an apprentice.

[10]This, however, does not preclude the chance of extraneous control arising out of structural imbalances (e.g., dependence on the formal sector) or institutional restriction (e.g., police harassment). These are additional issues which have been studied in (Amin, 1982.)

TABLE III

DISTRIBUTION OF INFORMAL SECTOR ENTERPRISES IN DHAKA BY EMPLOYMENT SIZE CLASS AMONG THE ALL FIVE ACTIVITY GROUPS IN THE SAMPLE

Activity Group	Employment Size Class			
	One Person Unit	Two-Person Unit	Unit with Three Persons or More	Total
Trade	106 (65.0)	39 (23.9)	18 (11.0)	163 (100)
Service	35 (53.0)	17 (25.0)	14 (21.2)	66 (100)
Manufacturing	22 (20.4)	24 (22.2)	62 (67.0)	108 (100)
Construction	49 (98.0)	— (—)	1 (2.0)	50 (100)
Transport	43 (86.0)	6 (12.0)	1 (2.0)	50 (100)
Total	**255** **(58.4)**	**86** **(19.7)**	**96** **(22.0)**	**437** **(100)**

Figures in parentheses show percentage distribution of units by size classes among the five activity groups in the final sample.

The small size of informal operations is also evident in Table IV which provides data on total assets employed in these enterprises. On average capital of little over Tk. 4,000 is employed per enterprise, the median value being only Tk. 1,500. Looking at the distribution of the variable, it is found that 81 per cent of enterprises have less than Tk. 5,000 in capital. When compared with capital employed per establishment in the formal sector (Tk. 5.5 million), capital needs of the informal sector enterprises look very small indeed.

TABLE IV

PERCENTAGE DISTRIBUTION OF INFORMAL SECTOR ENTERPRISES IN DHAKA BY CAPITAL* SIZE CLASS AMONG THE ALL FIVE ACTIVITY GROUPS IN THE SAMPLE

Capital Size Class in Tk.	Activity Group					
	Trade	Service	Manufacturing	Construction	Transport	Total
Below 500	15.3	33.4	8.5	92.0	0.0	25.5
500-999	22.7	13.6	3.8	4.0	13.3	13.5
1,000-4,999	51.5	37.9	50.9	2.0	26.7	42.0
5,000-9, 999	5.5	6.1	14.2	0.0	33.3	8.3
10,000-24,999	3.0	6.1	15.2	2.0	13.4	7.1
25,000-49,999	1.8	1.5	4.7	0.0	6.7	2.5
50,000 and above	0.0	1.5	2.8	0.0	6.7	1.3
Total	100.0 (163)	100.0 (66)	100.0 (106)	100.0 (50)	100.0 (15)	100.0 (400)**
Average Capital Employed	2,513	3,364	7,767	335	11,450***	4,109
Median Capital	1,325	1,200	3,338	60	5,000	1,500

*Include values of both fixed assets (owned by enterprises) and stock of goods and raw materials estimated at replacement cost by respondents.

**Other 37 units in the sample do not own any assets. These would be rickshaw drivers who do not own the vehicles they drive and construction workers who do not possess any tools at all.

***Calculated from 16 observations for those who own their vehicles. Only 32 percent of transport operators own the vehicles they drive.

VI. EARNINGS OF THE INFORMAL SECTOR LABOUR FORCE

Probably because of the lifestyle of participants in informal economic activities, there is a tendency to assume that the bulk of urban poor are accounted for by labourers in these activities. Such a presumption is contradicted by evidence in our sample. As Table V shows, the average income of the self-employed in the sector is about Tk. 960 per month, which is almost two-and-a-half-times the minimum wage in the country. When imputed wages for family labour are excluded.

money income of the self-employed declines to Tk. 830, which is still twice as much as the minimum wage. Similarly, when compared with average earnings of heads of squatter households in the city, earnings of the informal sector fare equally well. This evidence clearly rejects the tendency to equate the informal sector with the urban poor. The lowest income in our survey is earned by those who work in construction activities, but even their income is well above both the minimum wage and the average income of heads of squatter households.

Table V also shows that the average income is highest for manufacturing (Tk. 1,444) and lowest for construction (Tk. 643). In between, we have service (Tk. 875), trade (Tk. 824) and transport (Tk. 796) group. The complete ranking of the activity groups by income being : manufacturing (1st), service (2nd), trade (3rd), transport (4th) and construction (5th).[11]

TABLE V

MONTHLY AVERAGE INCOME OF SELF-EMPLOYED IN INFORMAL SECTOR COMPARED WITH FORMAL SECTOR MINIMUM WAGE

Indicator	Activity Group					Total Sample
	Trade	Service	Manufacturing	Construction	Transport	
Gross average income of the self-employed	824	875	1,444	643	796	961
Family employment per enterprise*	0.2	0.3	1.0	—	0.1	0.4
Owner net income**	767	769	1,038	643	796	832
Number of minimum wages***	1.9	1.9	2.6	1.6	2.0	2.1

*Family labour per enterprise excluding the owner-worker.

**Owner gross income minus imputed income for unpaid family members working in the enterprise. Income for family members are imputed at the wage rate for hired labour in the respective groups of activities.

***Owner net income divided by minimum wage in the formal sector.

As might be expected, there exists significant variation (at 0.01 level of Chi-square test) in the distribution of income across these activity groups (see Table VI). In the total sample of self-employed, 25 per cent earn below Tk. 600 per month

11It is interesting to note that this rank-ordering becomes a familiar pattern on the basis of several other indicators such as capital employed, income saved, profits invested, length of residence in the city, time engaged in the present activity, prospects of growth and advancement, etc. (see Amin, 1982).

which corresponds to the veriously identified "marginal" proportion of the informal sector. They can be considered marginal because, in addition to the reasons previously discussed, income below Tk. 600 is less than the income required to be above the poverty line. The proportion of marginal people is highest, as might be expected among construction activities (40 %), followed by 30 per cent in transport, 29 per cent in service, 28 per cent in trade and only 7 per cent in manufacturing. About half of the self-employed earning over Tk. 800, are in a position to afford a nutritionally required diet for a six-member family, which is not a small achievement in an economy like Bangladesh.[12]

This half, or to be more confident that 35 per cent who earn above Tk. 1,000, are in a fair economic position and are likely to save part of their income and reinvest in business. This prospect is greatest for manufacturing since a remarkable 68 per cent among them earn above Tk. 1,000, which of course is consistent with the relatively high capital-labour ratio in these activities.

TABLE VI

PERCENTAGE DISTRIBUTION OF SELF-EMPLOYED IN INFORMAL SECTOR ACCORDING TO THEIR MONTHLY INCOME AND TYPE OF ACTIVITIES

Income Bracket (in Taka)	Activity Group					
	Trade	Service	Manufacturing	Construction	Transport	Total Sample
Below 600	28.2	28.8	7.4	40.0	30.0	24.7
600-799	27.6	33.3	11.1	38.0	32.0	26.1
800-999	15.3	13.6	13.9	10.0	14.0	14.0
1,000-1199	12.9	3.0	13.9	10.0	10.0	11.0
1,200 and above	15.9	21.3	53.7	2.0	14.0	24.3
Total	100.0 (163)	100.0 (66)	100.0 (108)	100.0 (50)	100.0 (50)	100.0 (437)
Monthly Average Income	824	875	1,444	643	796	961
Median Income	700	625	1,200	600	625	750

Chi-square=95.7, df=16 and the distribution is statistically significant at 0.01 level of probability test. Cramer's V=0.23.

[12]In fact the size of this proportion will be a little higher if total family (household) income were considered. This in fact would be more reasonable because poverty line income here is defined with respect to the family, not for one individual.

The reasonably advantageous income position of the self-employed is not evident for employees in the informal sector. As can be seen from Table VII, the monthly average income of these wage employees is only Tk. 375 per month, which is not even half the average for the self-employed.

Compared to formal sector workers, their position would be much worse than it appears from the marginal difference between the minimum wage (Tk. 400) in the formal sector and the average income of informal sector employees (Tk. 375). This is so because employees in the informal sector lack comparable job security, accommodation (or house rent), health care and other fringe benefits, and relatively better working conditions. The distribution of income in the table shows that 34 per cent earn below Tk. 300 per month. The condition of these workers must be miserable especially for those whose income does not represent a second income to the household from which they come. In this regard, note that 35 per cent report they are the head of the household which suggests that their earnings are the main source of income for the household from which they come. Almost two-thirds of these workers' incomes fall below Tk. 500 mark.

Therefore, it is no surprise that 61 per cent of employees in the sector actively seek better work (see Table IX). It is interesting to note that only 46 per cent express interest in wage employment or salaried jobs in the formal sector (the corresponding proportion for owners is 22 per cent). This limited interest for more secure jobs in the formal sector may partly be due to their realization that the chance of getting such jobs is remote and partly due to their preference for self-employment, which is evident from the response of 37 per cent who expressed their intent of "starting own bussiness". Another piece of evidence also casts doubt about serious intent for those jobs. When asked what would they consider the minimum amount that they will demand for employment in the formal sector, everyone puts a disproportionately higher amount compared to their present income (by a ratio of almost two to one). One of the implications of this could be that employment in the formal sector is indeed a non-option so that the expected income is not put with any serious consideration. On the other hand, this could imply that the informal sector does offer prospects for a reasonable income which justifies them to expect an inducement premium over and above their current income. Our analysis of the scope for upward mobility provides some insights into this prospect.

Alternative Rural Income

One hypothesis, already called into doubt by evidence from other countries, is based on Mazumdar's model of the role of the informal sector in the process of job search which predicts an equilibrium level of informal sector income below that in rural areas (House, 1977 : 38). On the strength of their comprehensive survey of

migration literature, Rempel and Lobdell (1977 : 5.7) declare that they "are not aware of a single migration study that has been able to establish that migrants who chose to move were in an inferior position in their urban destination than they had been in their rural homes". Our evidence is not dissimilar in this respect.

In the case of Bangladesh, in general, it appears that money income of migrant squatter family-heads has increased substantially since their migration to cities (see CUS, 1976 : 68). Reported data in that study on squatter settlements in the country show that 65 per cent of the migrants used to earn below Tk. 300 per month prior to their migration compared to their average income of Tk. 380 in the city at the time that the survey was taken.

Our own survey data confirm this evidence. As can be seen from Table VIII, average income of the self-employed in the informal sector exceeds that of average rural households by a margin of 15 per cent. The latter group, moreover, may not represent an appropriate comparison from the point of view of the informal sector labour force who normally would not have access to land in the rural areas. Income of non-agricultural rural occupations or of wage labour in agriculture would be more appropriate as alternative rural income for most of the labour force in the urban informal sector. When income of the self-employed in the informal sector is compared with that of non-agricultural rural occupations, it appears that the self-employed in the informal sector earn twice the income they could expect in their most probable rural alternative. They fare still better when a similar comparison is made with wage labour in agriculture, whose income is about one-third of that obtained by the self-employed in the informal sector.

However, as would probably be expected, employees in the sector do not fare that well when similar comparisons are made between their urban income and some plausible rural alternative. They earn much less than the income of an average rural household or of that obtainable in non-agricultural rural occupations, which is not surprising since it is unlikely that they will have access to either of these income opportunities in rural areas. Given their limited access to land, capital and education, and in view of their personal and other migratory characteristics, and socio-economic background (see Amin, 1982) it is more reasonable to assume that work as wage labour in agriculture would have been their more probable rural option. Interestingly, compared to income of this group, employees in the informal labour force are found to be earning about 35 per cent more. This suggests tht even the income of employees in the urban informal sector is greater than their most likely alternative in rural areas.

In view of such evidence, there is little doubt that labour income in the informal sector exceeds that of its rural alternative. Two other related conclusions that emerge from above evidence are : first, the informal sector does offer some opportu-

TABLE VII

PERCENTAGE DISTRIBUTION OF EMPLOYEES (HIRED LABOUR) IN INFORMAL SECTOR ACCORDING TO THEIR MONTHLY INCOME AND TYPE OF ACTIVITIES

Income Bracket (in Tk.)	Employees in Trade	Employees in Service	Employees in Manufacturing	Total
Below 300	47.5	31.6	28.8	33.5
300-499	30.0	42.1	29.6	31.7
500-699	27.0	21.0	34.3	31.1
700-899	—	5.3	5.6	4.2
900 and above	2.5	—	1.9	1.8
Total	100.0 (40)	100.0 (19)	100.0 (108)	100.0 (167)
Average Monthly Income	285	354	406	375
Median Income	300	300	400	400

Except three units in construction and eight in transport, all activities in these two groups are one person operation. For this reason they are not shown in this table.

nities to improve economic positions of those whose rural alternative is not promising, second, which follows from the first, the decision of migrants to move to urban areas is clearly a rational economic decision. Even if they are forced into the informal sector, the prospects which draw migrants to urban areas do not vanish.

Alternative Urban Income

Modelling of the informal sector in a labour market perspective often assumes that the sector is a waiting ground for those seeking jobs in the formal sector. The hypothesis derived from this assumption predicts labour income in the informal sector will be lower than in the formal sector. This hypothesis tends to be generally supported by evidence from several informal sector studies elsewhere. For example, Sethuraman (1977b : 176) reports survey findings of some ILO studies which show that the average income and earnings of the participants in the informal sector tend to be low compared with the rest of the labour force in the formal sector. For Belo Horizonte, Brazil, Merrick (1976 : 845) finds earnings differences of up to 65 per cent between formal and informal sector workers, even after the effects of age, sex and education were allowed for. Similar results are contained in a recent work on 'Pakistan's Informal Sector', although the degree of such difference appears to be smaller (Guisinger and Irfan, 1980 : 416).

TABLE VIII

A COMPARISON OF RURAL, URBAN AND INFORMAL SECTOR INCOME

Income Groups	Average Monthly Income per Respective Household (in Tk.)
(1) Rural Income Groups :	
(i) Average rural households	940
(ii) Non-agricultural rural occupations	585
(iii) Wage of agricultural labour	368
(2) Informal Sector Income Groups :	
(i) Self employed or owners	1,083
(ii) Employees or hired labour	498
(iii) Total labour force	915
(3) Urban Income Groups :	
(i) Average Urban households	1,591
(ii) Formal sector factory workers	590
(iii) Construction workers in Dhaka city	857

Source : Informal sector incomes are obtained from our survey data. Rural and urban income of respective groups are based on data provided by Farouk and Ali (1977 : 24). Since their data come from a 1974 survey, it was necessary to adjust them for comparability with our survey data. This adjustment was done by applying wage rate indices provided by the Bangladesh Bureau of Statistics (see BBS, 1979 : 385). The figure for construction workers in Dhaka city is obtained from page 384 of the same volume.

Note : Statistical significance of the differences of the means between informal and other sectors could not be tested because of non-availability of necessary data for the latter groups. Tests were performed for the groups within the informal sector which show that the difference in income among owners, workers and the total informal sector labour force are statistically significant at 0.01 level of z-test (calculated value of z for the two closest means is 3.64 which is greater than the tabulated vaule of test-statistic z at one per cent level of significance).

Our data is not that clear cut in lending support to the hypothesis that predicts lower income for the labour force in informal activities compared to their counterparts in the formal sector. As can be seen from Table VIII, although average income of urban households is considerably greater than average earnings of the informal labour force, an altogether different picture emerges when average informal sector income is compared with average income of factory workers in the formal sector.[13]

[13]Comparison between the last two groups seem to be more reasonable in testing the hypothesis at hand since employment as factory workers or their equivalent (e.g., low-grade office jobs) is what the labour force in the informal sector can expect if such jobs would be available at

(*Contd. on page* 93)

The latter comparison shows that income of both self-employed and total labour force of informal sector is greater than wage earners in the formal sector : this tends to contradict the hypothesis of an income differential between the labour force in the two sectors. The hypothesis, however, holds if the relevant comparison is made only between employees of the two sectors. As can be seen in the same table, employees in informal enterprises earn 18 per cent less than their counterparts in the formal sector.

From the above evidence it would seem employees in the informal sector would have some economic reasons for seeking formal sector jobs while working in the informal sector. For the self-employed in the informal sector, employment in the formal sector offers little economic inducements. This finding, therefore, cautions against generalizing the informal sector's role as a stop-gap arrangement for participants in that sector while they search for wage employment or salaried jobs in the formal sector.

Attitudes and Motivations

The observations are further illustrated by evidence in Table IX. As this table shows, only 22 per cent of the self-employed in the informal sector show any interest in wage or salaried jobs in the formal sector. The corresponding proportion is more than double in the case of employees. This appears consistent with our previous conclusion that economic inducements (in terms of income differentials) to seek formal sector jobs operate mainly on employees of the informal sector. Similar contrasts between the two labour groups of the informal sector are observed in motivations with respect to current employment : compared with 26 per cent of the self-employed, 61 per cent of employees reveal that they are "looking for better work". Thus it becomes clear that the perception of current work in the informal sector as a stop-gap arrangement while searching for an alternative job is more common among the employees than the self-employed.

However, we must note that there are activities within the informal sector which do not provide even the self-employed with a satisfactory level of job security or income. This becomes evident in Table X which provides data on occupational preference and motivation in current work by activity groups. As can be seen, 80 per cent of our sample in construction activities express their preference for a regular job in the formal sector : only 2 per cent are inclined to continue in their present occupation. In identifying the reasons for their dissatisfaction, the majority put lack of

(*Footnote* 13 *contd.*)

all. This is so because "average urban households" in the preceding comparison includes urban high income earners like professional, businessmen, and high ranking public and private sector employees who do not form part of the formal sector labour force comparable to that of the informal sector.

TABLE IX

ATTITUDES AND MOTIVATION OF LABOUR FORCE IN INFORMAL SECTOR TOWARDS THEIR OCCUPATION

Indicator	Employment Status in the Labour Force	
	Self-employed	Employees
1. Occupation Preferred :		
(i) Salaried or wage job in formal sector	22.22	45.6
(ii) Own business/self-employment	77.3	36.6
(iii) Others*	0.5	17.8
2. Motivation in the Present Work :		
(i) Satisfied with present position	20.7	1.4
(ii) Looking for better work	26.4	61.1
(iii) Planning for other/own business	51.3	35.8
(iv) Thinking of returning to village	1.6	1.7
3. Major Concern Regarding Present Occupation		
(i) Lack of security/stability	45.1	46.4
(ii) Low Income	33.9	38.0
(iii) Long hours of work	20.4	14.4
(iv) Others	0.6	1.2

*For employees, others often refer to their intention to go for more education, training, acquiring skills. In few instances they imply going back for farming or inability to specify the preference.

security or stability of their employment as the major concern. This response is easily understood on recalling the casual nature of this industry which depends on the availability of construction work in the city. Also, strictly speaking, self-employment is a misnomer for this group since they usually work through subcontractors in construction business and hence have a dependent status. Therefore, it is no surprise that they consider their present employment in much the same way as do employees in the informal sector. To a lesser extent, the same is true for those who are self-employed in transportation as a substantial proportion of them are dependent on the owners of the vehicles they drive and, therefore, are self-employed only in some limited sense. The self-employed in trade, service and manufacturing activities are not constrained by such dependencies. As a result, they show little interest in formal sector jobs and express their overwhelming preference for self-employment either in their present activity or in a business in some different line [see 2(i) and 2(ii) in Table X].

Could this preference be a mere reflection of participants' realization that there is little chance of getting jobs in the formal sector so that they do not consider

TABLE X

ATTITUDES AND MOTIVATION OF SELF-EMPLOYED IN INFORMAL SECTOR TOWARDS THEIR OCCUPATION BY ACTIVITY GROUP

Indicator	Activity Group					Total Sample
	Trade	Service	Manufacturing	Construction	Transport	
1. Occupation Preferred :						
(i) Salaried or wage job in formal sector	19.0	6.0	1.9	80.0	40.0	22.2
(ii) Continue with current one or business in similar line	81.0	94.0	98.2	20.0	56.0	77.3
(iii) Returning to farming	—	—	—	—	4.0	0.5
2. Pereference between Current or Different Business :						
(i) Present one	42.3	31.8	75.0	2.0	22.0	41.9
(ii) Different one	55.2	56.1	13.0	68.0	52.0	46.0
(iii) Others	2.4	12.1	12.0	30.0	26.0	12.1
3. Major Concern Regarding :						
(i) Lack of security/stability	47.1	44.7	36.7	44.1	51.3	45.1
(ii) Inadequate income	29.7	33.0	53.2	27.9	32.9	33.9
(iii) Long hours of work	22.6	21.4	9.2	27.9	15.8	20.4
(iv) Others	0.7	1.0	0.9	—	—	0.6

such alternative employment as a realistic option? Although there is some truth in such an explanation, it seems to be an inadequate one. If such were the case, 80 per cent of the self-employed in construction activities and 46 per cent of employees in the total sample would not have indicated that they are interested in jobs in the formal sector. If realization of paucity of wage jobs were an adequate explanation for absence of greater interest among the informally employed labour force, then that would have been equally applicable for all employees as well as those who are employed in construction.

Thus it would be more realistic to explain the preference in terms of income earning opportunities available within the informal sector. However, we must

search beyond a static income comparison to fully appreciate the preference for self-employment. Because even if pay is no higher in the formal sector, regular pay, job security, health benefits, pension/provident fund/gratuity benefits, better working conditions, better status and other fringe benefits that are associated with such employment are not available to the labour force of the informal sector. Indeed, nearly half of the labour force, of both self-employed and employee categories, do recognize the lack of security and stability of their employment as a major concern. In comparison, low income as a factor of dissatisfaction appears to be relevant for one-third of the respondents. A sizeable proportion (20 per cent) complain about long hours of work [see 3(i)—3(iii) in Table X]. That despite this realization of lack of security and stability that is associated with income and employment in informal activities, the great majority of the participants in these activities intend to remain self-employed in the informal sector can only be explained if participation in these activities provide an opportunity to maximize life-time income potential. Our examination of the scope of upward mobility within the informal sector in the next section provides some evidence in this respect.

VII. SCOPE FOR UPWARD MOBILITY IN DHAKA INFORMAL SECTOR

During the survey, conversations with participants produced conflicting indications on the scope of upward mobility within the informal sector. On the one hand, instances of transition from work as domestic servants to casual work in construction activities to rickshaw driving and, *still* better to petty trade were not found to be uncommon. Similarly, examples of erstwhile employees and apprentices of the sector now having their own businesses and workshops were also met with frequently.[14] On the other hand, conversations with a second-hand cloth seller revealed that it took nearly 30 years for him to reach his present self-employment status. The enterprise he owns has total assets below Tk. 1,000 ; although it provides him a living, clearly it does not represent a symbol of great success. In between his long journey from domestic servant to present self-employment as a petty trader, he worked as an ice-cream seller by peddling through the city streets. One cannot be certain whether this is an exception or the norm to expect in the informal sector.[15] Similar examples of stagnancy or very slow upward mobility or, even of owners becoming employees were not rare either.

Such conflicting patterns based on casual observations underscores the need to collect systematic data through a questionnaire survey in order to examine the scope of upward mobility in the informal sector. Ideally, as Mazumdar (1976 : 655)

14 For data in this respect, see Table XII.

15 As a matter of fact, it will soon become evident from our survey data that too much reliance on case studies in the above fashion may exaggerate the overall picture.

notes information on lifetime performance of workers should come from longitudinal studies. As a second best alternative information on job history was collected in the survey.[16]

Information on the past three jobs, in addition to the current one, for each individual participant was collected for this purpose. As can be seen from Table XI, only 4 per cent of those currently self-employed worked in more than three jobs, 14

TABLE XI

PERCENTAGE DISTRIBUTION OF SELF-EMPLOYED IN INFORMAL SECTOR ACCORDING TO NUMBER OF JOB HISTORIES (BY ACTIVITY GROUP)

Activity Group	Number of Job Histories				Total
	Just the Present One	One More	Two More	Three More or Above	
Trade	55.8	35.6	7.4	1.2	100.0 (163)
Service	47.0	31.8	16.7	4.5	100.0 (66)
Manufacturing	28.7	43.5	20.4	7.4	100.0 (108)
Construction	68.0	18.0	12.0	2.0	100.0 (50)
Transport	32.0	44.0	18.0	6.0	100.0 (50)
Total Sample of Self-Employed	46.5	35.9	13.7	3.9	100.0 (437)
Total Sample of Employees	52.5	31.5	9.5	6.5	100.0 (200)

per cent worked in two and 36 per cent worked in just one before starting the present one. For the rest, 47 per cent, the present job is their first employment in the city. Thus, our analysis of job histories is comprised of (1) 17 persons who had three or more previous job experiences, (2) 60 persons who had two and, (3) 157 persons who had one such experience before starting the present enterprise. For the remaining 203 of the sample, present employment is their first job.

Table XII shows that 70 per cent of the currently self-employed were employees in their preceding job. This provides an indication of self-improvement since change of employment status from employee to self-employed implies higher current

[16]The major weakness of this method is its inability to include those who failed in their ventures in the informal sector.

TABLE XII

PERCENTAGE DISTRIBUTION OF CURRENTLY SELF-EMPLOYED* IN INFORMAL SECTOR ACCORDING TO THEIR EMPLOYMENT STATUS IN THE PRECEDING JOB

Activity Group	Employment Status in Preceding Job		Total
	Self-employed	Employees	
Trade	45.7	54.3	100.0 (105)
Service	16.7	83.3	100.0 (36)
Manufacturing	19.4	80.6	100.0 (36)
Construction	12.8	87.2	100.0 (39)
Transport	27.8	72.2	100.0 (18)
Total Sample	30.3	69.6	100.0 (234)

*Those currently self employed who had at least one other job previous to the present one.

income and better future prospects. However, some qualifications need to be made about the figures in the table. As pointed out previously, a substantial proportion of our sample in transport and construction activities are not self-employed in the sense of having scope to take self initiative or control over the fruits of their labour. Therefore, it is likely that the actual proportion of change from employee status to self-employment, in a more meaningful sense, would be smaller than what is suggested by the figures in our table. Having said that, however, there remains little ambiguity in the evidence that 54 per cent of the currently self-employed in trade and over 80 per cent of those in both service and manufacturing activities were employees in their preceding employment. Since our analysis of income showed that those self-employed earn substantially more than do employees this transition in employment status must be condsidered a significant step forward in self-improvement and upward mobility.

This view gains additional impetus from cross-tabulation of data on age and employment status, which shows that the ratio of the self-employed to employees in the labour force of the informal sector rises with age (see Table XIII). This is an indirect indication of upward mobility within the informal sector as one advances in age and experience. Since the same criterion of mobility cannot be applied to formal sector employment, a comparison of such opportunities for mobility in the two sectors cannot be made. Although as one advances in seniority, promotions are assured for competent formal sector employees, it is unlikely

TABLE XIII

EMPLOYMENT STATUS BY AGE OF THE INFORMAL SECTOR LABOUR FORCE (PERCENTAGE)

Age Group	Total	Employment Status in Preceding Job		Total
		Self-employed	Employees	
Under 15	100	7	93	7.9
15-24	100	36	64	38.9
25-34	100	69	31	33.7
35-44	100	89	11	14.8
45 and over	100	89	11	4.8
Total Sample	All	55	45	100.0 (790)

that such upward mobility would be faster than the possibilities in the informal sector. As Guisinger and Irfan note (1980 : 415) there exists within the informal sector much scope for ingenuity and motivation to be "rewarded by sharp and rapid increase in income". In an attempt to test this proposition, we examine the income profile of the labour force in the informal sector from our data on their job histories.

Table XIV provides chronological average income of the presently self-employed in their past and present employment. Two distinct patterns are observed in these income figures. First, income tends to increase steadily as one proceeds from one job to another, reaching its maximum in the present one. As can be seen from the table, money income in each job is greater than that of the preceding one : (1) 17 individuals who have three or more past job histories earned Tk. 294 in the third last job (which may or may not be the first job), Tk. 443 in the next one, Tk. 488 in the following one, and finally Tk. 1,494 in the present one ; (2) similarly, 60 individuals who had worked in two more jobs in addition to the current one earned Tk. 340 in their first work, Tk. 467 in the next one and finally Tk. 1,115 in the present activity ; (3) likewise, 157 individuals who worked in only one job before the curent one used to earn Tk. 282 in that work compared to their present income of Tk. 1,021. In contrast, 203 individuals for whom the present work is their first work in the city earn the least—about Tk. 825 per month, which is below the average income of the self-employed (the average being Tk. 961).

The second pattern of these results is illustrated in the last column of Table XIV which shows that income from present activity steadily rises with number of job histories or experiences : (1) those with no job history, except of course the current one, earn the least, Tk. 825 ; (2) those with one job history earn Tk. 1,021, (3) those

TABLE XIV

INCOME PROFILE (FROM JOB HISTORY) OF SELF-EMPLOYED IN THE INFORMAL SECTOR

Total Sample of Self-Employed According to Number of Job (s) History	Average Monthly Income (in Tk.) in Chronological Order of Jobs			
	Third Last	Second Last	Last One	Present One
(1) Those who worked in three or more jobs previously (n=17)	294	443	488	1,494
(2) Those who worked in two more jobs (n=60)	—	340	467	1,115
(3) Those who worked in one more job (n=157)	—	—	282	1,021
(4) Those for whom the present activity is the first employment in city (n=203)	—	—	—	825

Except the difference between 443 and 488 on the one hand and 1,021 and 1,115 on the other, all other differences among the means are statistically significant at 0.25 level of z-test.

with two job histories earn Tk. 1.115 nand (4) those with three or more job histories earn the miximum, Tk. 1,494.

Since the figures in the table represent money income (or income at market prices), some uncertainty remains as to the validity of the first pattern of the results which suggest a steady increase in income over time as participants in the informal sector move from one job to another. But there is no such ambuiguity about the second pattern which illustrate higher income for those who have worked through the various phases of informal work. Although experience is more than mere accounting for number of past jobs, the second pattern does suggest a direct relationship between income and experience.

Turning to the complication posed by inflationary considerations in interpreting the results of steady increase income over time, it is certain that the real margin of difference in income between one job to another will be lower than what it appears from the figures in Table XIV. But it is safe to claim that at least part of the increase in income from one job to another represents true economic improvement. This does not seem to be an unjustified claim because while the self-employed usually raise the service charge when pressed with higher prices of essential commodities, the wage and salary earners are faced with an unenviable condition of "fixed income" because there is no provision of yearly renewal of service contract or making adjustments to income or inflation. Thus it is the money income which is fixed, not the real income. Against this background, it seems reasonable to conclude that the

TABLE XV

INCOME PROFILE (FROM JOB HISTORY) OF EMPLOYEES IN THE INFORMAL SECTOR

Total Sample of Employees Grouped by Number of Job History	Average Monthly Income (in Tk.) in Chronological Order of Jobs			
	Third Last	Second Last	Last one	Present One
(1) Those who worked in htree or more jobs previously before the present one (n=13)	244	346	435	562
(2) Those who worked in two more jobs previously (n=22)	—	242	338	423
(3) Those who worked in one more job before present one (n=70)	—	—	295	441
(4) Those for whom the present work is the first employment	—	—	—	334

Unlike the findings for owners in the preceding table, the differences in means in this table are not statistically significant for most cases.

above evidence of increase of income overtime does indicate the scope of upward mobility within the informal sector.

To a lesser extent, the same pattern holds for employees in the informal sector. As can be seen from Table XV, the margin of increase in income from one job to another is much smaller in this case compared to that of the self-employed. Thus the scope of self-improvement appears limited for employees in the sector. As previously discussed, employees in the informal sector have little future prospect unless they gain employment in the formal sector or become self-employed in the informal sector.

Ability to Save and Invest

Other evidence in the survey further reinforce our arguments above. Data on savings of informal proprietors, their remittances to rural areas, new investment undertaken by them and their intention to expand further and improve their present enterprise, shown in Table XVI and XVII, would illustrate this and corroborate our previous finding on the opportunity that the informal sector offers to the disadvantaged urban labour force.

As Table XVI shows, over 35 per cent of the total sample of owners earn a monthly income above Tk. 1,000, which is above the nutritionally based poverty

TABLE XVI

SOME EVIDENCE ON INFORMAL ENTERPRISES' ABILITY TO SAVE AND INVEST

Index	Activity Group					Total Sample
	Trade	Service	Manufacturing	Construction	Transport	
Percentage of owners earning above Tk. 1,000 monthly	28.8	24.2	67.6	12.0	24.0	35.2
Percentage of owners reporting monthly savings	52.1	27.3	50.0	18.0	64.0	45.3
Monthly average saving of those who do save (Tk.)	120	136	187	106	94	135
Annual savings (Tk.)	1,041	1,344	1,742	686	939	1,238
Savings as percentage of monthly income	14.6	15.5	13.0	16.5	11.8	12.5
Percentage of owners remitting money to rural home	63.8	40.9	42.6	78.0	40.0	54.0
Monthly average remittances (Tk.)	259	308	388	240	288	289
Remittances as percentage of total household income	28.2	26.2	25.7	35.1	29.5	26.7
Percentages of enterprises reporting new actual investment :						
(i) Substantial	34.4	19.7	22.2	4.0	31.3	24.8
(ii) Some	54.6	63.6	59.3	38.0	50.0	55.1
Percentages of owners relying entirely on enterprise income for new investment	87.7	88.9	79.1	90.9	86.7	84.7
Percentages of enterprises reporting improvement in the business (combination) of sales production, etc.	65.9	86.4	89.9	88.0	69.4	79.2

line of a six member family in Bangladesh.[17] It is reasonable to expect that at least this 35 per cent have the ability to invest part of their earnings. This expectation is supported by data on the ability to save and invest : 45 per cent of owners admit of some regular savings and 80 per cent report that they were able to make 'substantial' or 'some' new investment (25% reporting substantial and 55% reporting some, account for the total 80%). Almost all this new investment seems to have been

17 Tk. 750 is estimated to be the requirement for meeting such needs in 1979 prices, which is calculated by an upward adjustment (for price changes) of the original estimate by Khan. According to him, it required Tk. 488 per month in 1975-76 for an average 6.5 member househod in Bangladesh to be above the nutritionally based poverty line (Khan, 1980 : 7).

financed by savings from the income of the respective enterprise, as 85 per cent report enterprise income as the source of their investment. This has been possible despite the fact that 54 per cent of the owners send on average some 27 per cent of their total income regularly to rural areas, which is of course over and above meeting subsistence needs of the remitter's urban household.

Although there is a positive element in this self-financing capacity of informal enterprises, it also reveals some limitations imposed on their expansion by the constraints on the level of their savings. While about 12 per cent of income is saved, this proportion does not represent a substantial amount in absolute terms. As can be seen in the table, annual average saving is about Tk. 1,200 (for the total sample), which would hardly enable one to buy new equipment or to build a structure or even to increase the stock of goods substantially. Therefore, it is no surprise that only 25 per cent of the enterprises reported substantial investment since their estabilishment.

Nevertheless, examination of Table XVII clearly suggests the forward-looking attitude of informal entrepreneurs, with the sole exception of those who work in construction activities who have little scope to change their lot through their present job, as manifested in the intention to expand their respective enterprises and the direction of such expansion as illustrated in evidence on proposed expansion. Given capital is always a constraint for small businesses, particularly in a setting in which organized credit is not accessible to them, such clearly defined objectives (see Table XVI) in expanding businesses cannot be expected from a group if they were stagnating and had little chance of present and future hope for accumulation.[18]

However, we would like to note that between 20 and 25 per cent of enterprises could not add anything to their original investment, as suggested by evidendce in the preceding table. They can hardly think of any expansion or improvement. In fact, 27 per cent report that they either have no plan to expand, or do not have any scope for expansion, depending on the nature of their activities [see 2(ii) and (iii) in Table XVII]. Probably this is the group who are merely subsisting in their present activity which leaves little room for capital accumulation. This finding seems to be consistent with suggestions made in several other studies that informal sector activities may be classified into two distinct groups : (1) those which lead to the accumulation of capital and (2) those leading only to subsistence.[19] But often what is ignored by the writers who draw this distinction is that the proportion of those belonging to the second group, variously called the marginal or subsistence group, is much smaller than the proportion of those who belong to the first group. At most, a quarter of the self-employed may be called marginal in terms of their potential for growth and

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[18]Note that responses on proposed expansion represent answers to open-ended questions and hence reflect their plans more accurately.

[19]See Bose (1974), Bienefeld (1975), LeBrun (1975), Gerry (1978), and Sinclair (1978).

TABLE XVII

ENTERPRISES INTENDING TO EXPAND AND DIRECTION OF SUCH EXPANSION AND IMPROVEMENT

Responses	Activity Group					Total Sample
	Trade	Service	Manufac-turing	Construc-tion	Transport	
1. Interest in Expanding the Enterprise :						
(i) Intends to expand	87.1	66.7	90.7	4.0	66.0	73.0
(ii) No interest in expanding	12.3	25.8	9.3	2.0	2.1	11.3
(iii) No scope for expansion	0.6	7.6	0.0	94.0	31.9	15.7
Total	100.0 (163)	100.0 (66)	100.0 (108)	100.0 (50)	100.0 (47)	100.0 (434)
2. Direction of Expansion :						
(i) Building structure or owning the present one	62.0	45.5	27.6	-	—	42.6
(ii) Large-scale operation	12.7	31.8	24.5	-	—	17.7
(iii) Owing the vehicle or buying another one	—	—	—	—	96.8	9.5
(iv) More stock of goods and raw materials	9.9	2.3	5.1	—	—	6.3
(v) Building structure and buying tools	1.4	4.6	13.2	-	—	5.4
(vi) Modernizing the enterprise	3.5	2.3	8.2	—	—	4.4
(vii) Buying more tools and equipment	—	6.8	9.2	-	—	3.8
(viii) Owning the land from which the business is operated	0.7	2.3	10.2	—	—	3.8
(ix) Becoming a wholsaler	6.3	—	—	—	—	2.8
(x) Hiring more workers	1.4	2.3	—	—	—	0.9
(xi) Starting own business	—	—	—	100.0(2)	3.2	0.9
(xii) Another business	2.1	—	—	-	-	0.9
Total	100.0 (142)	100.0 (44)	100.0 (98)	100.0 (2)	100.0 (31)	100.0 (317)

accumulation. In our sample, they are concentrated mainly in construction activities, although some would be found in all activities. In contrast, manufacturing activities offer the best potential in growth and accumulation. But this potential, in varying degrees, is noticeable all across the activities in the sector.

VIII. OVERALL TREND IN THE DATA

Finally, we shall limit ourselves to a brief examination of our overall evidence in an attempt to identify the respective proportions of enterprises in the total sample reflecting the marginal characteristics of the "community of the poor" and the dynamic attributes of the "intermediate sector". Table XVIII summarizes findings on a number of indicators which reflect the attributes that are associated with the group in the informal sector which has variously been called the "marginal" group, "the community of the poor" or the "irregular sector". The table shows that the proportion of enterprises reflecting marginal characteristics ranges between 25 and 35 per cent depending on the index used. The various measure in the table clearly suggest that this is the group which has little growth potential since they have no long-term commitment to their occupation. This is of course expected because

TABLE XVIII

PROPORTION OF INFORMAL SECTOR ENTERPRISES REFLECTING MARGINAL CHARACTERISTICS BY ACTIVITY GROUP (PERCENTAGE)

Index	Activity Group					Total Sample
	Construction	Transport	Trade	Service	Manufacturing	
Below poverty level income (Tk. 600)	40.0	30.0	28.2	28.8	7.4	24.7
Will be happy to get wage employment	80.0	40.0	19.0	6.0	1.9	22.2
Looking for better work	82.0	50.0	14.7	23.4	9.3	26.4
No interest or scope for expanding the enterprise	94.0	34.0	12.9	33.4	9.3	27.0
No new investment since establishment	58.0	18.8	11.1	16.7	18.5	20.0
Recent Migrants	56.2	40.9	32.2	22.2	14.7	31.3
In current activity for less than three years	40.0	38.0	26.4	25.7	27.0	29.1
No improvement in business (sales or otherwise)	12.0*	30.6	36.7	18.2	14.8	24.9

*This figure is out of line with the general trend of the evidence in the table. It merely, indicates that construction work has been generally available in the last few years. Hence this should not be considered an indication of economic potential of those who are employed in these activities.

their involvement in informal activities does not allow them a level of living even above the poverty line.

But obviously the majority of entrepreneurs in our sample does not reflect marginal characteristics. Although people who are struggling to eke out a living will be found in some proportion in all activities in the sector, they appear to be largely concentrated in construction. It will be recalled that construction activities in our sample represent mostly work of a casual nature. Thus, those in construc-truction are more similar to employees that to the self-employed. To a lesser extent, this is also true for those in transport. Most measures indicate that between one-third to one-half of the sample in transport reflect marginal characteristics, which

TABLE XIX

PROPORTION OF INFORMAL SECTOR ENTERPRISES REFLECTING ECONOMIC POTENTIAL BY ACTIVITY GROUP (PERCENTAGE)

Index	Activity Group					Total Sample
	Manufacturing	Service	Trade	Transport	Construction	
Above average income (Tk. 1,000)	67.6	24.2	28.8	24.0	12.0	35.2
Regular monthly savings	50.0	27.3	52.1	64.0	18.0	45.3
Interest in expanding the enterprise	90.7	66.7	87.1	66.0	4.0	73.0
Enterprises reporting substantial investment	22.2	19.7	34.4	50.0	4.0	24.8
Improvement in business (sales and otherwise)	89.9	86.4	65.9	69.4	88.0*	79.2
Have lived in the city for ten or more years	57.3	43.2	35.0	31.8	20.8	38.8
In current activity for ten or more years	25.0	21.2	18.4	14.4	4.0	18.3
Prefers to continue in the present business	75.0	31.8	42.3	22.0	2.0	41.9
Present activity is a chosen occupation	81.3	39.4	22.4	18.0	10.0	37.6
Satisfied with the present occupation	33.3	26.6	13.5	22.0	8.0	20.7
Want to continue in the present occupation for whole life	87.0	37.9	31.9	14.0	12.0	42.1

*As indicated in the note with the preceding table, this figure in isolation of other figures provide a misleading indication of prospect of construction activities. High response here simply indicates an increase in construction activities in the city in recent years.

trade and service groups appear to have relatively lower proportions of marginal people. This proportion is lowest in manufacturing.

In contrast to the above evidence, Table XIX shows that the proportion of enterprises reflecting strong growth potential ranges between 25 and 40 per cent, depending on the measures used. Some measures indicate even higher proportions of enterprises with potential for expansion and development. The proportion of enterpirses reflecting growth potential varies widely across the activity groups.[20] Consistently, manufacturing enterprises show maximum potential. Therefore, the bulk of the so called "intermediate sector" or "modern informal sector" enterprises is likely to be found within this group.

IX. SUMMARY AND CONCLUSIONS

In summing up the paper, first we would like to note that the generally optimistic indicators of economic performance in informal enterprises and of their participants should be interpreted with some caution. Since there was no simple way to include within the survey those who failed in their attempt to become established, our results may have some biases in favour of those who succeeded in carving out an informal occupation. But one need not be overly concerned about this since their is no reason to suspect that our sample, drawn randomly from a well-defined sampling frame, over-represents successful enterprises. After all existing firms also include those which may be on the verge of failure or may fail in future.

Also, the reasonably good performance of informal enterprises is possible because of very hard work, what has been called "self-exploitation" of the individuals who work in these activities. Long hours of work (on average 13 hours a day) with no weekly or fixed holiday for most of the businesses, although perhaps not unusual for self employment in general, nonetheless represent an element of self-exploitation. This is particularly threatening for people in activities like driving rickshaws, pulling and pushing hand carts, and certain construction works. Absence of acceptable working conditions and sanitation facilities make it particularly hazardous for health and hence working life and may even reduce life expectancy.

Against this background, let us briefly summarize some of the unambiguous findings of the paper. First, income of the informal sector labour force compare

[20]In view of this, emphasis is put on the respective proportions of "marginal" and "dynamic" enterprises within each activity group. This is also important because the total sample in the survey is not based on "actual" proportions of the activity groups in the "population" of the informal sector. In the absence of a complete census of all activities in the whole city those proportions cannot be determined accurately. The task of adjusting the figures corresponding to the total sample, the ireforc, remains for future research.

favourably with comparable rural and urban labour income. Thus the informal sector seems to offer an opportunity to transform participants' "unfavourable personal characteristics"[21] into productive assets through ingenuity and hard labour. This opens up some ways for self-improvement and breaking out of poverty. Our data on job histories confirm this prospect. For they provide a clear indication of upward mobility within the informal sector, both in terms of change in employment status (from employee to self-employed) and a steady increase in money income over time. This opportunity, however limited it may be, explains the prevailing preference among the informal sector participants to continue in their present or similar occupations instead of looking for formal sector wage employment.

Second, the presence of two groups in the informal sector with different economic prospects is confirmed by evidence from Dhaka. While about a quarter of the total enterprises could be considered as marginal, it seems safe to conclude that upwards of one-third show significant economic potential. In between we have the rest of the total for whom the informal sector offers an average living, not a bad contribution in the context of a general scarcity of income earning opportunities. This study further indicates that these groups occur in varying proportions in different infromal activities.

We would, however, stress that the case for an informal sector stractegy of development does not rest on the relative proportions of these two groups. Even if the group of enterprises reflecting dynamic attributes were fewer, the informal sector's role is too important to be ignored in the prevailing socio-economic conditions in Bangladesh : helping to absorb the growing urban labour force, putting material resources to their mazimum use, adapting a technology that responds to factor availability and over which the users have command, providing some basic needs at affordable prices.[22] To be realistic, it seems that the informal sector way of doing things is almost inescapable in the short and medium term, no matter whether the economy traverses through the traditioral path of gradual development or a revolutionary course. In one sense the growth of the informal sector epitomizes the overall crisis in the economy and in another it offers the opportunity to overcome that crisis.

21This is a reference to the hypothesis that informal sector labour force consist of disadvantaged group of urban labour force who are believed to be young and female possess a little education and skill. For details and evidence see Amin (1982).

22For evidence in these respects see Amin (1982).

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Note

The World Jute Market*

by

MUHAMMAD MAHMOOD

AND

ROSS A. WILLIAMS**

I. INTRODUCTION

In studies of international commodity markets relatively less attention has been given to jute. This is unfortunate given its key role in the Bangladesh economy and its importance to the economies of India, Nepal and Thailand. The world jute market differs from those for many other tradeable commodities produced by developing countries in that consumption in the producing countries is a relatively large proportion of world consumption. In 1978, producing countries in South and South-East Asia accounted for 30 per cent of world consumption of jute goods. China consumed a similar percentage.

This paper has two main objectives. First, we look at production consumption and trade in jute in the major producing countries with a view to develop a jute model. Accordingly, production equations are developed for raw jute in Bangladesh, India and Thailand and consumption of manufactured jute in these countries is estimated, together with consumption in the rest of the world. The long-run price of jute is determined within the model. The second objective is to analyze the impact of important exogenous variables on production, consumption and price of jute in the three producing countries.

Section II contains a brief description account of demand and production conditions, paying attention to trends over time. Section III presents the empirical model. The results of impact analysis and their implications are discussed in Section IV. Some concluding remarks are made in Section V.

*This note draws heavily to the first named author's unpublished Ph.D. Thesis, *The World Jute Market* (University of Melbourne, 1981).

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II. SALIENT FEATURES OF THE WORLD JUTE MARKET

Demand for Jute Goods[1]

Jute is probably best known for its worldwide use in packaging in the form of bags, and carpet backing. It is a very durable fibre and dimensionally stable which facilitates its reusage in packaging.

World consumption of jute goods at the outbreak of World War II was around 2 million tonnes. It grew at an annual average rate of 4.8 per cent from 1947 to 1959, but fell back to 1.7 per cent per annum over the period 1960-77. Table I shows the demand by country groups over the past 20 years. The dominant feature of the table is the expansion of demand in China : from 11 per cent of the world total in 1961 to 29 per cent in 1978. Strong growth has also occurred in India. There has been a modest growth in consumption of jute goods in other developing countries associated with the gradual expansion in their agricultural production. Consumption of jute goods has fallen in OECD countries owing to competition from other products in both packaging and floor coverings. The major competition since the 1960's has been from synthetics made from polypropylene. Commercial production of polypropylene commenced around 1960-61, the starting period in Table I. World production was around 0.3 million tonnes in 1965, rising to

TABLE I

CONSUMPTION OF JUTE GOODS

Year	South & East Asia (%)	China (%)	Other Developing (1) (%)	OECD (2) (%)	Total (million tonnes)
1961	22.7	11.4	21.3	39.9	2.37
65	23.9	11.9	23.0	37.5	3.50
70	24.6	16.9	21.2	34.1	3.54
75	33.5	22.6	21.7	19.9	3.61
78	29.5	29.0	19.4	20.3	3.85

(1) Africa, Latin America, East Europe, Middle East.

(2) North America, West Europe, Japan and Oceania.

Source : FAO estimates.

[1] Data on jute consumption was kindly supplied by FAO.

1.33 million tonnes in 1970 and 3.46 million tonnes in 1978. Table I shows that the absolute fall in demand for jute goods in OECD countries dates from the mid-1960's. The multinational companies producing polypropylene have encouraged its use through intense market promotional campaigns and by adopting pricing policies which exploit the joint nature of the product and the differing competition in different geographic markets. At the same time uncertainty has often surrounded the price and delivery of jute, thus encouraging substitution away from it.

Polypropylene, being an oil based synthetic, benefited from the fall in the real price of oil during the mid-1960's and early 1970's. The OPEC engendered rise in oil prices, particularly in the late 1970's, has restored some of the competitive edge to jute.

Supply of Jute Fibre[2]

The total area under jute shows an increasing trend from the late 1930's to the early 1960's where it stabilised at a little under 3 million hectares. World production of jute has broadly followed the variation in area under cultivation. Short-term fluctuations in production are greater than those in area mainly due to weather conditions. The average growth rate in the production of jute fibre was 6.1 per cent per annum over the period 1947-59 but fell to 1.8 per cent over the period 1960-77. India, Bangladesh and China currently account for around 85 per cent of world production but their relative contributions vary from year to year. Thailand, the other major producer, was responsible for a further 7 per cent of world output in 1978. Bangladesh's share of world production of jute fibre has fallen from 50 percent in 1950 to 27 percent in 1978, a figure similar to the shares currently enjoyed by India and China.

Virtually all the increase in world production since 1961 has come from China. However, this increased production has been needed to satisfy local demand. China is still a (small) net importer of jute fibre.

Trade in Jute[3]

World trade in jute fibres has declined substantially from 1.13 million tonnes in 1950 to 0.55 million tonnes in 1978. In 1950 Bangladesh was virtually the sole exporter of jute fibre and thus her exports have shown an even greater decline with the growth of competitive exporters, principally Thailand. Indeed at the time of

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[2]Sources of data : FAO, *Production Yearbook* (various issues) Government of Thailand : Agricultural Statistics of Thailand.

[3]Sources : FAO, Association of European Jute Industries, *Statistical Year Book and Industrial Fibres* (annual).

the partition of the South Asian subcontinent in the later 1940's 88 per cent of Bangladesh's output of raw jute was exported. This figure had fallen to 19 per cent by 1978/79.

World trade in jute goods rose from 1.1 million tonnes in 1955 to 1.4 million tonnes in 1965 and has subsequently fallen back to the 1955 level. Whereas, in 1955 India exported over 80 per cent of the total, by 1978 exports of jute goods from Bangladesh marginally exceeded those from India (together these countries supplied over 90 per cent of total exports of jute goods). In 1978 about half the exports of jute goods went to Western Europe and North America.

III. A MODEL OF THE WORLD JUTE MARKET

The model contains sixteen equations (including identities). On the supply side, there are equations for the production of raw jute in Bangladesh, India and Thailand. Both area planted and yield are modelled. Production in the rest of the world, primarily China, is treated as exogenous. There are four equations for the consumption of manufactured jute: in Bangladesh, India, Thailand and the Rest of the World.

As one unit of manufactured jute requires as an input about one unit of raw jute it follows that in the long run the volume of raw jute produced must be approximately equal to the volume of jute goods consumed. This technical constraint closes the system by linking the supply and demand equations.

All behaviourlal equations are in double logarithmic form. It follows that coefficients represent elasticities. The double logarithmic form makes it easy to test equations for homogeneity in prices. The disadvantage is the need to convert linear identities to logarithmic form. This is done by using a first-order Taylor series expansion around the means of the logarithms.

The main data sources have been given in Section II. Additional sources were World Bank publications and government publications in Bangladesh, India and Thailand. All equations were estimated by least squares using annual data. The supply equations use annual data for a period 1948/49 to 1976/77, the demand equations use annual data for the period 1961 to 1977.

Supply Equations

The area planted under jute in Bangladesh was specified to be a function of the prices and yields of raw jute and rice. Standard supply response functions are appropriate as the various price support schemes and acerage restrictions have been largely ineffectual.

The coefficient on the price of raw jute is expected to be positive. Rice is both the main competitive crop and the basic staple and jute acreage is therefore expected to be negatively related to the price of rice. Insofar as rice is grown as a subsistence crop, increases in rice yield will mean that food needs can be met from a smaller acreage and more land can be devoted to the cash crop, jute. The sign of jute yield is uncertain. It will be positive if farmers are producing more rice than is required for their own food, it will be negative if farmers prefer to hold their cash income from jute relatively constant and use the increased jute yield to switch land from jute to rice. For historical and institutional reasons farmers are reluctant to plan on using increased revenue from jute to buy rice.

Estimates of the acreage equation for jute in Bangladesh are given in equation 1 in Table II. Statistical tests showed it was valid to use price and yield ratios. A lagged value of acreage was included. The estimated short-run elasticity of supply with respect to the price of jute is 0.39 ; the corresponding long-run estimate is 0.69. Increases in jute yields relative to rice yields exert a negative effect on acreage.

The acreage equation for India is given as equation 4 in Table II. It has an identical structure to that for Bangladesh but is not as well determined. Acreage appears to react less to price changes in India than in Bangladesh. In Thailand rice is not so much a competitive crop and the equation includes only a jute price and a time trend (equation 7), but the coefficient on price is not statistically significant.

In the yield equations climatic conditions were significant only in Thailand. Elsewhere a trend term is used.

Demand Equations

Conventional explanatory variables are used to determine a consumption of jute goods, namely the real price of manufactured jute and gross domestic product. The empirical estimates are given as equations 11 to 14 in Table II. The price elasticities are all round—0.2. There are substantial variations in the income elasticities. In the producing countries these range from 0.2 in Bangladesh to 1.6 in India. In the equation for the Rest of the World the high income elasticity is offset by a relatively large trend term representing factors such as the spread of bulk handling. In the equation the deflator in the price term is the price of synthetics (polypropylene). As expected, jute goods consumption has been strongly affected by the 1971 war of independence in Bangladesh.

IV. RESULT OF IMPACT ANALYSIS

Having discussed the model and estimation of its parameters, let us return to analyses of the effects of some important external variables on the endogenous

TABLE II

LONG-RUN WORLD MODEL OF DEMAND FOR AND SUPPLY OF JUTE

Supply of Raw Jute

Bangladesh

1. $\ln A = C_1 + \underset{(4.76)}{0.387}\ln(p^j/p^r)_{-1} - \underset{(2.80)}{0.373}\ln(Y/YR)_{-1} + \underset{(3.31)}{0.440}\ln A_{-1}$, $R^2=0.67$, $h=0.20$

2. $\ln Y = C_2 - \underset{(2.21)}{0.0068}T$, $R^2=0.15$, $DW=1.26$

3. $\ln P = \ln A + \ln Y$

India

4. $\ln A = C_4 + \underset{(1.80)}{0.144}\ln(p^j/p^r)_{-1} - \underset{(1.79)}{0.506}\ln(Y/YR)_{-1} + \underset{(5.09)}{0.608}\ln A_{-1}$, $R^2=0.56$, $h=0.05$

5. $\ln Y = C_5 + \underset{(4.46)}{0.0072}\,T$, $R^2=0.41$, $DW=2.14$

6. $\ln P = \ln A + \ln Y$

Thailand

7. $\ln A = C_7 + \underset{(1.03)}{0.245}\ln p^j_{-1} + \underset{(2.23)}{0.1245}\,T$, $R^2=0.77$, $DW=1.38$

8. $\ln Y = C_8 - \underset{(1.58)}{0.024}\ln(R\text{-}R)^2 - \underset{(2.76)}{0.021}\,T$, $R^2=0.59$, $DW=1.34$

9. $\ln P = \ln A + \ln T$

Total

10. $\ln P = C_{10} + 0.350\ln P\,(\text{Bang}) + 0.445\ln p\,(\text{India}) + 0.128\ln P\,(\text{Thai}) + 0.77\ln P\,(\text{R of W})$

Consumption of Manufactured Jute

Bangladesh

11. $\ln C = C_{11} - \underset{(1.10)}{0.170}\ln(P^j/P) + \underset{(1.53)}{0.185}\ln P - \underset{(4.33)}{0.391}D$, $R^2=0.69$, $DW=1.46$

India

12. $\ln C = C_{12} - \underset{(1.14)}{0.260}\ln(P^j/P) + \underset{(12.64)}{1.621}\ln GDP_{-1}$, $R^2=0.91$, $DW=1.44$

Thailand

13. $\ln C = C_{13} - \underset{(0.92)}{0.295}\ln(P^j/P) + \underset{(2.61)}{1.025}\ln RP_{-1}$, $R^2=0.54$, $DW=1.72$

Rest of World

14. $\ln C = C_{14} - \underset{(2.76)}{0.193}\ln(P^j/P^s)_{-1} + \underset{(4.53)}{2.657}\ln GDP - \underset{(5.37)}{0.1206}\,T$, $R^2=0.88$, $DW=1.57$

15. $\ln C = C_{15} + 0.0221\ln C\,(\text{Bang}) + 0.249\ln C\,(\text{India}) + 0.031\ln C\,(\text{Thai}) + 0.698\ln C\,(\text{R of W})$

Demand = Supply

16. $\ln P = \ln C$

Notation : A = acreage of jute, Y = yield of jute, P = production of jute, C = consumption of manufactured jute, p^j = price of jute, p^s = price of synthetics, p = wholesale prices, RP = price production in Thailand, p^r = price of rice, YR = yield of rice, D = dummy for Bangladesh Independence, T = time trend, R = rainfall in Thailand. Standard errors are in parentheses. DW is the Durbin-Watson statistic and Durbin's h statistic replaces DW when the equation contains a lagged dependent variable (h is distributed as the unit normal).

variables of the jute model discussed above. The impact of policy or exogenous variables can be examined by determining the impact multipliers of the model. If the model is dynamic, the impact on a given endogenous varibale is distributed over time. It must be borne in mind that the method is comparative static in nature. The effect on endogenous variables of a one-shot increase of one exogenous variable, while the values of all others are held constant, is assessed, one by one.

Long-term multipliers may be obtained from the estimated model given in Table II, by solving for the endogenous variables in terms of the exogenous variables, i.e., by inverting the basic system. It is assumed that in the long run all jute prices move proportionally (irrestpective of processing stage or country) so that as the model is logarithmic only one jute price enters the list of endogenous variables. Similarly, rice yields,rice prices and wholesale prices are assumed, in turn, to show the same proportional movements in Bangladesh, India and Thailand. The rainfall variable in equation 8 is subsumed into the constant.

Eleven exogenous variables are left in the final form. These are GDP in Bangladesh, India, Thailand and the Rest of the World ; Rest of World production of jute fibre ; prices of synthetics, rice and wholesale goods in South Asia ; rice yield ; a dummy variable for Bangladesh independence ; and a time trend.

The long-run multipliers for all exogenous variables except the dummy variable and time trend[4] are given in Table III. The more interesting findings relate to the effect of economic growth on the production and price of jute. Each 1 per cent increase in Rest of World GDP is estimated to raise production and consumption of jute by 1.3 per cent per annum other things remaining equal. Growth rates of around 4 per cent are thus needed for static jute consumption. Similarly, a 1 per cent increase in rest of world GDP is estimated to raise jute prices by 2.9 per cent.[5]

The effect of synthetic prices on jute production and price is relatively small. A 10 per cent increase in the price of synthetics is estimated to raise jute production and consumption by only around 1 per cent ; the effect on jute prices is about 2 per cent.

Movements in wholesale prices in Asia have a relatively small effect on world production and price of jute. The elasticity of jute prices with respect to rice prices

[4] Since a dummy variables and trend variables both are proxies for "unaccounted" conglomerate socio-economic factors. In other words we do not know what they represent. Therefore, it makes little sense to investigate their impact on endogenous variables of the model.

[5] This is a real price increase becauseit is calculated by assuming that all other prices in the model remain constant. Atlernatively, all prices in the model (including jute) can be thought of as being measured in real terms. Both interpretations are equivalent as prices enter the equations in ratio form.

TABLE III

LONG-RUN MULTIPLIERS, EQUILIBRIUM WORLD MODEL FOR JUTE*

Endogenous Variables	Real	G D P	Exogenous Variables		Other Jute Production	Prices			Rice Yield
	Bangladesh	India	Thai.(1)	R of W		Synth.	Asian Wholesale	Rice	
Prduction									
Bangladesh	.004	.439	.035	2.017	—.084	.146	.070	—.250	—.212
India	.002	.233	.018	1.072	—.045	.078	0.37	—.133	.824
Thailand	.002	.156	.012	0.715	—.030	.052	.025	.156	—.311
Consumption									
Bangladesh	.184	—.108	—.008	—.496	.021	—.036	.153	—.108	.216
India	—.001	1.490	—.010	—.601	.025	—.044	.185	—.131	.262
Thailand	—.002	—.187	1.010	—.861	.036	—.063	.265	—.188	.375
R of W	—.001	—.123	—.010	2.094	.023	.152	—019	—.123	.245
Total P & C	.003	.277	.022	1.274	.024	.093	.044	—.127	.253
Jute Price	.006	.635	.050	2.918	—.121	.212	.101	.638	—.127

*Coefficients are elasticities except for last two columns where entries represent proportional effects.

(1) Rice Production.

is estimated to be around 0.6. Increases in rice yields lower jute production in Bangladesh and Thailand, but raise it in India. In the structural equation for Bangladesh, increases in rice yields raise jute acreage because rice is grown mainly for subsistence. But this lowers jute prices, and because of the relatively high price responsiveness of jute acreage in Bangladesh, the long term result of an increase in rice yields is to lower jute production. India, on the other hand, jute acreage is much more responsive to rice yields than it is to prices. Jute production in the Rest of World affects only jute prices, the estimated elasticity being—0.12.

Turning to the long-term implications for trade, in India the consumption of jute goods is much more responsive to growth in Indian GDP than is production of raw jute. The relevant long run elasticities in Table III are 1.5 for consumption and 0.23 for production. This will be the dominant effect on the exportable balance, and suggests a continuation of the fall in Indian exports of jute goods, at least as a proportion of total production. Offsetting factors are : (i) the responsiveness of Indian production to world growth ; and (ii) increases in synthetic prices raise production of jute in India and lower consumption (relevant elasticities are 0.08 for production and—0.04 for consumption) ; (iii) increases in rice yields increase jute production more than they increase jute consumption.

If prices (synthetics, wholesale, rice) and rice yields are held constant, and real GDP in all regions increases by 4 per cent per annum, the estimates in Table III imply that jute consumption in India will increase by 6.6. per cent per annum where as production will remain relatively static.

The estimates in Table III suggest that production of raw jute in Bangladesh is about twice as responsive to world economic growth as is production in India. Notice, however, the very large negative trend term for Bangladesh production in the final form equations. Growth in the Bangladesh economy has a relatively small effect on consumption of jute goods. It would seem that a high rate of economic growth in both the producing countries and the Rest of the World would reduce India's exportable surplus of manufactured jute and the shortfall would be made good by increased exports from Bangladesh. The results in Table III also show that production of raw jute in Bangladesh is relatively sensitive to changes in the price of synthetic substitutes.

The estimates in Table III imply that Thailand will have a growing exportable blalance. But this result arises solely because of the extremely large time trend effect (12.5 per cent per annum) in the acreage equation. It is unlikely that growth can continue at this rate. The income effects are such as to increase consumption more than production.

V. CONCLUDING REMARKS

Our general findings are that unless world GDP growth is as high as 3 to 4 per cent per annum in real terms, demand for jute goods will decline(for a given real level of prices of synthetic substitutes). Sustained growth in world GDP is likely to result in Bangladesh jute goods being substituted for Indian goods in export markets as Indian production would be required in the home market. These conclusion are broadly in agreement with those of FAO.[6]

A 17 per cent increase in the price of polypropylene is estimated to have the same effect on jute as a 1 per cent increase in world GDP. However, in the medium run the real price of polypropylene is unlikely to show much real increase and may well fall. Even in the late 1970's the substantial rise in the price of oil was accompanied by over-capacity in the petro-chemical industry which modified the increase in the price of polypropylene. Furthermore the planned expansion of the petro-chemical industry in the Middle East is likely to check the growth in consumption of jute in this region where demand previously doubled from around 70 thousand tonnes in the early 1970's to 140 thousand tonnes in 1978. Any attempts by governments in developing countries to build up petro-chemical industries is bound to adversely affect world demand for jute.

6See FAO, Jute, Kenaf and Allied Fibres : Supply, Demand and Trade Projections, 1985 (Revised Version), Document No. CCP :JU 79/3. Rome.

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